MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 7 APRIL, 1935 Number 11

NRA

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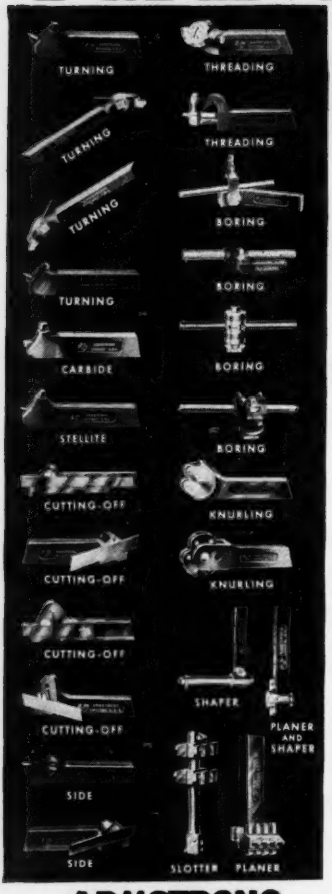

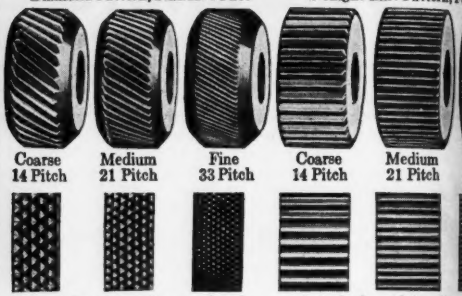

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CINCINNATI, OHIO VOL. 7, No. 11

APRIL, 1935

A Trip Through the Cleveland Tractor Plant, II

In this article the author describes some interesting machining operations on tractor frames and other large parts.

BY HOWARD CAMPBELL

THE transmission cases and other heavy parts for "Cletrac" crawler tractors are machined in the same building in which the tractors are assembled and finished for shipment. As stated in the previous article on this subject, a wide aisle is provided inside the east wall of the building for the entrance of motor trucks, making it possible for the trucks to deposit the rough castings at the point where they will be required for the first operation. Overhead monorail conveyors equipped with electric hoists make it possible, however, to move the parts if necessary. A view of the aisle in the heavy parts building is shown in Fig. 9.

Such parts as tractor transmission cases are obviously too heavy for handling with roller conveyors, so to facilitate the handling of such parts between the machines, a monorail, also equipped with electric hoists, is suspended from the ceiling and parallel with the lines of production

Fig. 9—Parts are brought into the building by motor truck and stacked at the ends of the machine lines in which they are to be processed.

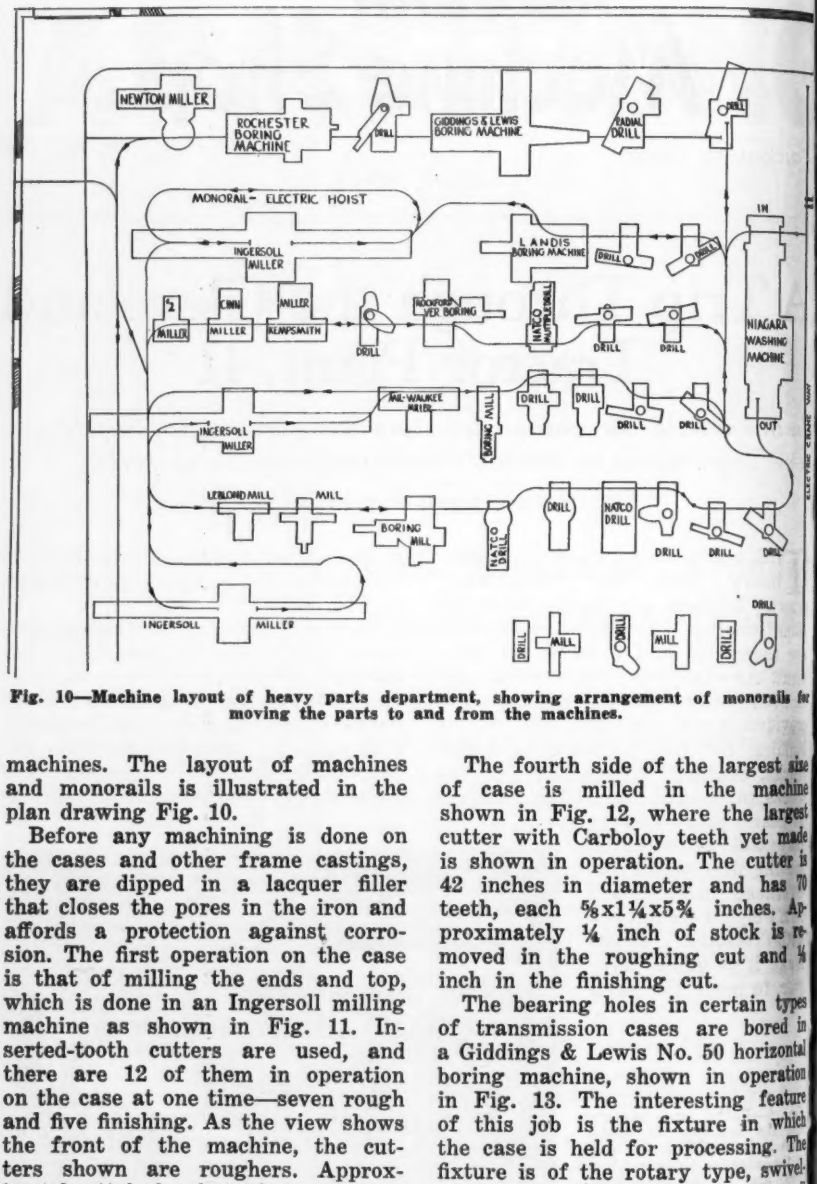

Fig. 10—Machine layout of heavy parts department, showing arrangement of monorails for moving the parts to and from the machines.

machines. The layout of machines and monorails is illustrated in the plan drawing Fig. 10.

Before any machining is done on the cases and other frame castings, they are dipped in a lacquer filler that closes the pores in the iron and affords a protection against corrosion. The first operation on the case is that of milling the ends and top, which is done in an Ingersoll milling machine as shown in Fig. 11. Inserted-tooth cutters are used, and there are 12 of them in operation on the case at one time—seven rough and five finishing. As the view shows the front of the machine, the cutters shown are roughers. Approximately ¼-inch of stock is removed in this operation.

The fourth side of the largest size of case is milled in the machine shown in Fig. 12, where the largest cutter with Carboloy teeth yet made is shown in operation. The cutter is 42 inches in diameter and has 70 teeth, each ⅝x1¼x5¾ inches. Approximately ¼ inch of stock is removed in the roughing cut and ¼ inch in the finishing cut.

The bearing holes in certain types of transmission cases are bored in a Giddings & Lewis No. 50 horizontal boring machine, shown in operation in Fig. 13. The interesting feature of this job is the fixture in which the case is held for processing. The fixture is of the rotary type, swiveling on a central bearing so that all sides of the case can be presented

to the tools in their turn.

To hold the case firmly in position under the pressure and torque exerted by the heavy boring bars and reamers, a clamp is provided that locks in position over the top of the work-piece as shown in the illustration. This clamp, necessarily of very heavy design, is hinged to the fixture as shown in Fig. 14. In order to provide for raising the clamp so that the work can be inserted and removed, a gear segment is built onto it, the teeth of the segment meshing with the teeth of a pinion that is carried on a shaft which also carries a worm wheel. The worm wheel meshes with a worm that is revolved by means of a hand-wheel, as shown in the illustration.

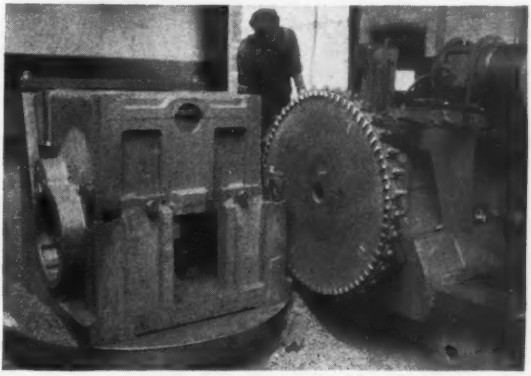

Fig. 12—The fourth side of the case is machined with this cutter, which is 42 inches in diameter and has 70 teeth of Carboloy.

Thus the clamp is easily raised or lowered by revolving the hand-wheel. When in position, it is locked at the free end by means of swivel clamping bolts, illustrated in Fig. 13.

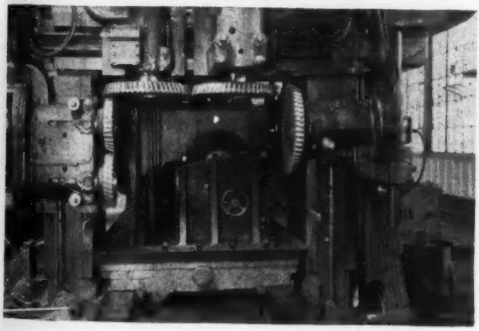

Fig. 11—Milling three sides of the transmission case for a "Cletrac" tractor. Twelve cutters are in operation on this case at one time.

The bearing holes in cases for tractors of a lighter type—the Model 35—are bored and reamed in the Rockford combination horizontal and vertical machine shown in Fig. 15. Three holes are finished longitudinally and one hole is finished at right angles in this piece. Here, again, the interesting feature of the job is the fixture in which the work is held for machining.

In order to locate the work-piece properly, a hinged fixture is used which, when open, appears as shown in Fig. 16. Two massive hinges, visible in Fig. 15, provide means for swinging the fixture open for receiving the piece and for swinging it into line with the horizontal and vertical tools for machining. The movement of the fixture is controlled through an air cylinder at the left side of the machine column, the piston rod being connected to a toggle mechanism which is also connected to the end of the fixture, as shown. Clamping bars for locking the case in position in the fixture are controlled by hand wheels

at the end and side of the fixture. Both the vertical boring bar and the heads for the horizontal bars are operated by individual motors.

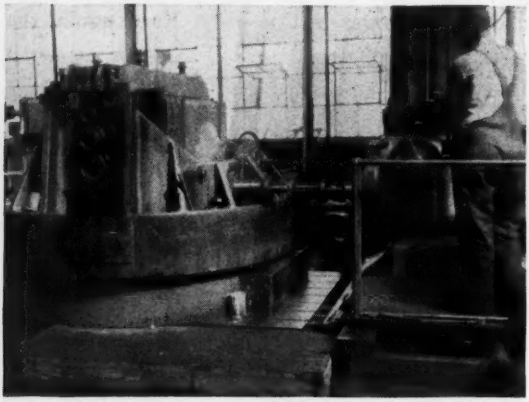

Fig. 13—Boring the crank and cam bearing holes in the case. The fixture can be rotated to present the various sides of the case to the tools.

As the transmission cases reach the end of the line of machines, they arrive at the huge washing machine through which all the cases pass before they are turned over to the assembly department. After being washed thoroughly, each case is fitted with the parts which comprise the transmission case assembly and are then transferred to the final assembly line, which extends lengthwise of the building and at right angles to the machine and sub-assembly lines.

The final assembly line shown in Fig. 17 consists of an adjustable-speed conveyor 320 feet long, running between steel rails that are 16 inches apart. Until such time as the tractor is provided with its own track, the assembly is carried along on two 4-wheel dollys that run on the track and are pulled by the chain conveyor. The speed of the conveyor can be varied from 6 inches to 18 inches per minute; thus by varying the speed of the conveyor or the number of men employed on the line, a predetermined number of tractors will be delivered to the test floor in a given number of hours.

Machine lines and sub-assembly benches are aligned crosswise of the building in the proper order so that the various parts and sub-assemblies will reach the final assembly line at the points where they are needed for assembling to the tractor. Engines, which are brought in from another plant, are stored at the front end of the assembly line. When required, they are delivered to the final assembly line by means of an overhead crane. Transmissions and other heavy parts and assemblies are delivered to the final assembly line in the same manner.

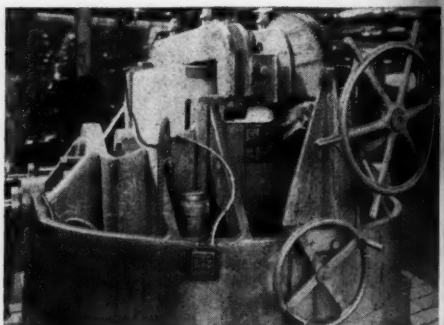

Fig. 14—Rear view of fixture, showing hand wheel and gearing for raising and lowering the clamp that holds the case in position.

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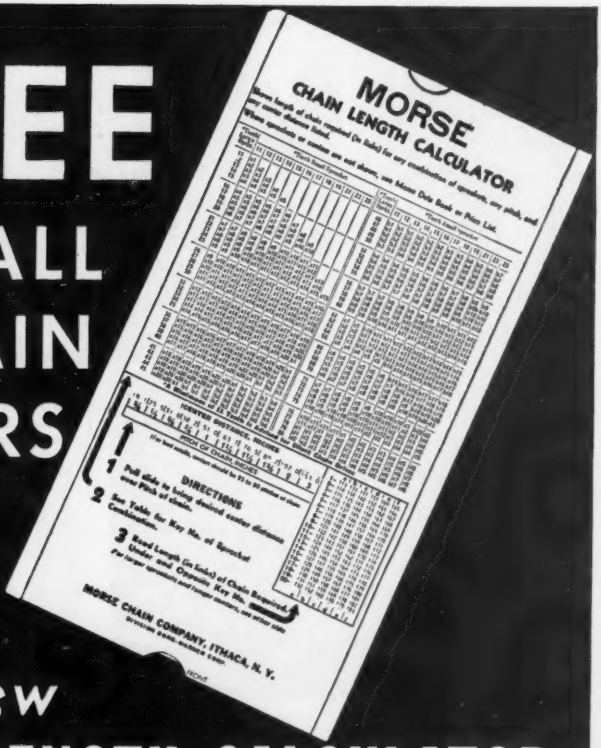

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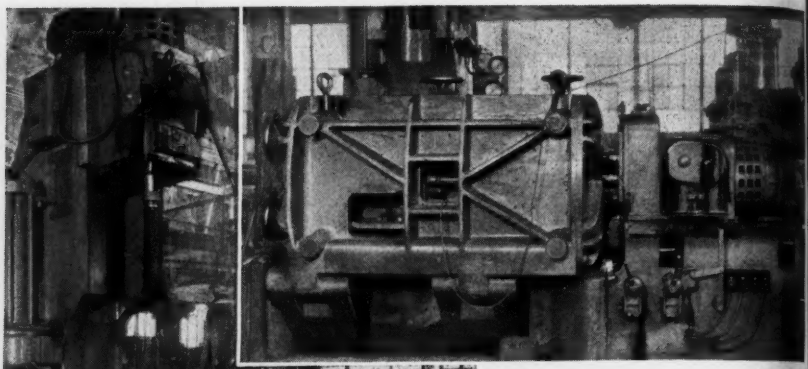

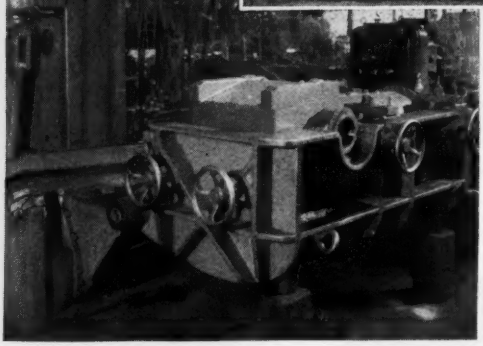

Fig. 15 (Above)—The main bearing holes and cam shaft bearing holes in cases for lighter types of tractors are bored and reamed in this machine. Fig. 16 (Left)—Here the fixture is shown open so that the case can be lowered into it or removed. Power for swinging the fixture into place is supplied by the air cylinder on the side of the machine.

In assembling a tractor, the first part required is the frame. As soon as the sub-assembly of a transmission case with a frame is completed, it is placed on dollies on the assembly line. The engine is then set in and the job is moved to the next sub-assembly station. At the right in the illustration Fig. 17 is the unloading end of the 1490-foot overhead conveyor that transports gears, shafts, bushings and other light parts from the building described in the previous article of this series (March, 1935, issue of MODERN MACHINE SHOP). The parts are removed from the conveyor at approximately the points where they will be required in the tractor assembly, and are stored in kegs and boxes parallel with the assembly line. To aid in transferring the parts to the points where they are added to the tractor assemblies, four Euclid cranes of 1-ton and 2-ton capacity, of 12-foot span and equipped with seven hoists, are provided.

The last part to be assembled to the tractor is the "track", which consists of a number of steel track shoes joined together by the use of heavy hinge pins that are forced into place by hydraulic power. To expedite the operation, a hydraulic press is located on each side of the line, for the right and left tracks. The tractor is now ready to stand on its own feet, consequently it is disengaged from the dolly, which is returned to the starting end of the line. Gas and water are now supplied to the tractor from convenient nozzles and it is started under its own power.

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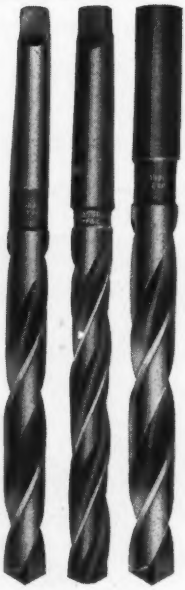

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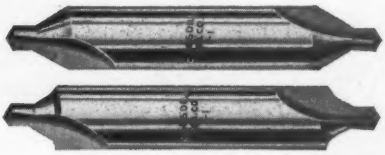

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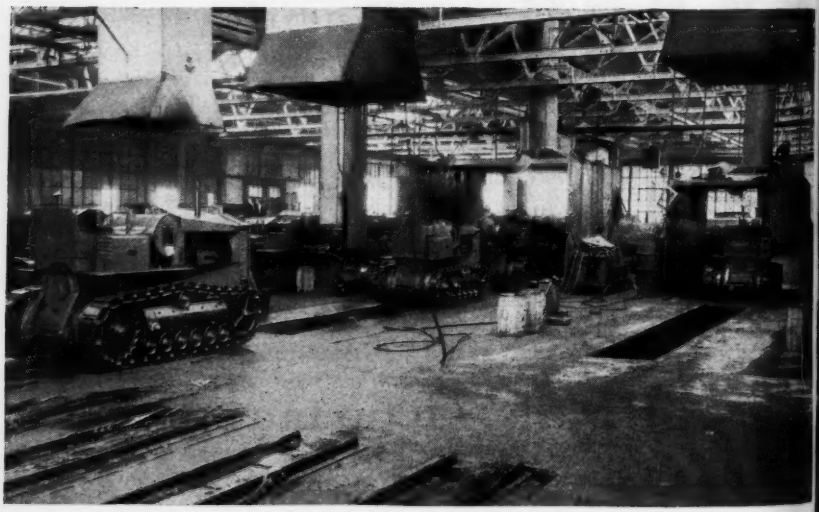
Fig. 17—View of final assembly line. The unloading station for a 1490-foot overhead conveyor can be seen at the right.

shown in Fig. 18, where it is given a thorough work-out at all speeds. Whatever adjustments may be required are made, the final painting is done, bearings are lubricated, and the tractor is ready for shipment.

Fig. 18—Here the tractor is given the final test and adjustment. When it leaves this floor, it is ready for shipment.



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Cost Reduction And Control Through Accurate Time Measurements

In which the author makes the point that, under the codes, the elimination of waste is more important than ever before.

By F. W. SHUMARD

THE observance of industrial codes, especially those clauses concerning maximum working hours and minimum wages, is causing the aggressive type of manufacturer to investigate his production methods more closely than ever before. He is becoming alert to the wisdom of replacing old fashioned or outmoded equipment and machinery in order to obtain greater output during the shorter working hours and their attendant increased labor costs.

Output per man has, therefore, taken on a far greater significance in these days of intensive manufacturing. In a modern plant it is doubtful if the executive or engineer, no matter how skilled, can find many so-called dollar savings. In fact, in some plants, the chances of penny savings are remote, because of the searching investigations that are constantly being made by all those responsible for the reduction, standardization and control of productive costs.

Not only are manufacturing processes and operations gone over with a fine tooth comb, but the work of other departments is coming in for the same type of cost scrutiny. Among these departments are the stock, shipping, repair, maintenance, experimental, general office and others previously considered as being exempt from such microscopic examination. In other words, the search for cost savings now extends into many branches of business which, because of lack of foresight on the part of engineers, or by reason of long profit margins, have previously been immune from investigation.

No matter how modern a plant may be in its equipment or personnel, there are countless fractional penny cost savings to be made, the sum totals of which will be found to run into astonishing yearly amounts. Here, then, is a fertile field of endeavor, but it can not be cultivated, nor the full fruit of success enjoyed, by the employment of casual methods.

The proper method of obtaining cost reduction and control is by means of accurate time measurement principles applied to all repetitive work performed in office or factory. The generally accepted tool or instrument used for time measurement is the stop watch—one of the most challenged tools in use in industry.

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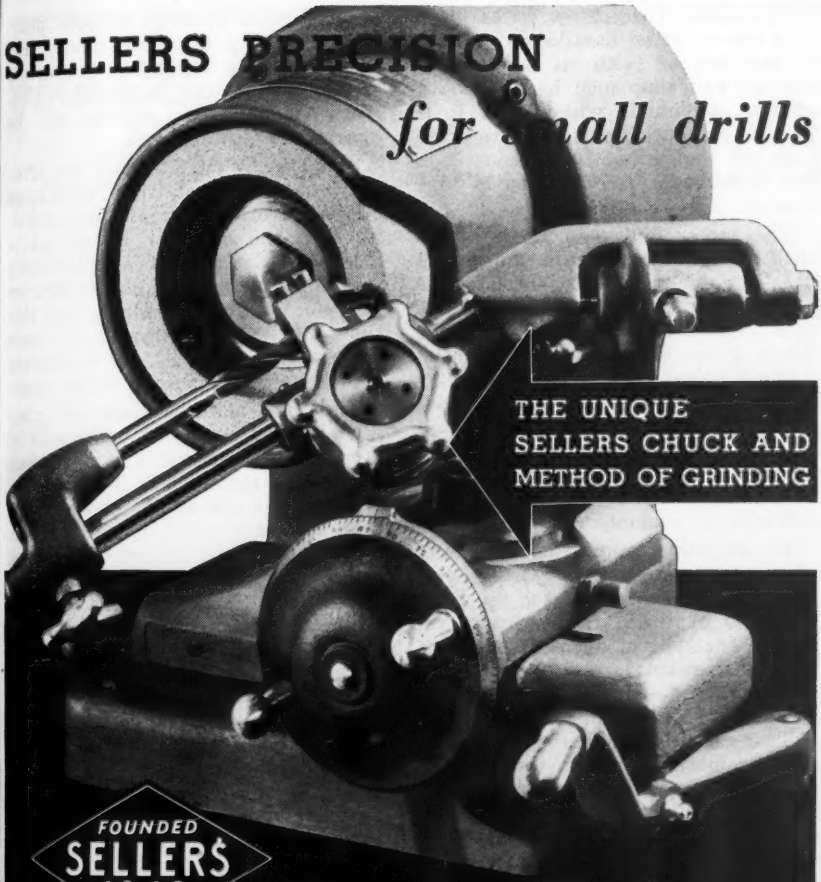

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One reason why stop watch findings are so often assailed is because of the lack of faith on the part of officials and shop men in the ability of the individuals whose task it is to establish such findings. More often than not the lack of faith is justified, due to frequent errors found in time studies.

The mere ability to operate and read the dial figures on a stop watch does not qualify one to specify time allowances for a manual or machine task. The watch readings obtained for a given element of work mean nothing unless they are sustained by certain correlated incidentals. Chief among them are the values attached to each watch reading. For example: a watch reading of 1.75 minutes has no significance unless that time specification is evaluated.

To properly evaluate each reading of watch figures requires a recognition of the efficiency of the machine, the kind of work, the accuracy required, the type of operator used, his fatigue frequency, and many other considerations—each depending upon the general relationship that all bear to the task. Thus time study work has become a science in these industrial recovery days and should be attempted only by those whose background and experience qualify them for such important engineering work.

One sure sign of the use of incorrect time study methods is the periodical cutting of time allowances or piece work prices in an effort to force an increase in production. If the time studies had been correctly made in the first place, no cutting or adjustments would be necessary other than those accruing from changes officially made in machinery, materials or methods not provoked by labor earnings. To slowly nurse some job from a bad condition through its period of convalescence into a healthy cost status by means of frequent time or price cuttings is poor practice. Not only are both money and time lost in so doing, but the morale of the whole plant will suffer. Correctly made time studies can be guaranteed against cut.

Also, faulty time studies are often the cause of loose time allowances or piece work prices of such liberality that the operator is enabled to hold his earnings at approximately the same point throughout different pay periods. It is usually a sign that time studies were improperly made when nothing short of an earthquake will cause variance in operator wages.

The able and well-seasoned manager of a plant continually asks of himself many questions. Among them are: "How modern are my machines, how capable are my foremen, executives, operators, what can I do to raise quality and cut costs?" and so on. To his list of mental questions should be added, "How much do my time study men know?" If his answer to this last question is not satisfactory, he should take immediate steps to remedy the situation. A time study man of mediocre ability can nullify the advantages of modern equipment and expert supervision, consequently such work should be placed in the hands of men who have had special training along these lines.

To emphasize this point, when a factory decides to manufacture a new or revised product, many items enter into the picture. The project may call for buildings, materials, machinery, equipment, man-power and a host of other things. The services of machine tool makers, designers, engineers, accountants, plant executives and others are required in order to make possible the successful launching of the new product.

After all of these details have been attended to and each operation is in readiness, the time study man is per-

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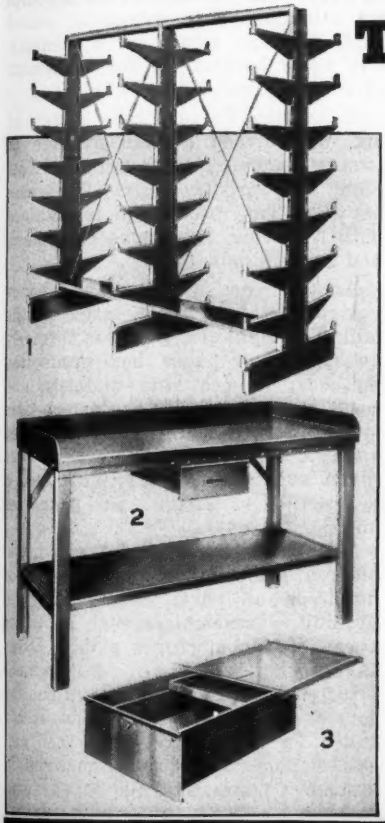

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haps the last man called into play. His job is to accurately measure the time required for each operation and determine the probable production per job. It may be said that his figures and specifications are the most important ones; his time study data becomes the index from which cost figures are projected. In these days of keen competition, cost figures must be low, and since the time study man contributes so much to the profit and loss statement, he should be one of the most highly skilled individuals in any organization. The extent to which his findings affect the general wage level and morale of the factory organization and the success of the project as indicated by the ledger can be drawn from the following examples.

In a large New England foundry, four units of especially-designed air and electrically-operated molding equipment were installed to mold castings for various sizes in large daily quantities. Each unit required a crew of twenty men. The molding costs were too high, and the blame was placed on the design of the apparatus rather than on the skill and efficiency of the crew members.

Months were spent in tuning up each unit and finally three different plant officials decided from their stop watch findings that eighteen flasks per hour was the best average output obtainable per crew on the medium sizes of castings. Accordingly, the task was set for that hourly production and all twenty men in each crew seemed to be kept quite busy producing an output of eighteen flasks per hour.

It was soon found that costs were still too high to meet the keen competition offered by rival concerns, so an expert time study engineer was called in from outside sources. This engineer found upon analysis that the same crew, without change in equipment or working any harder, could produce twenty-four flasks per hour and this level of production was reached without any difficulty. The 33⅓ per cent increase in output, with its attendant cost reduction, placed that company again on a competitive basis because of the institution of correct time study methods.

In another foundry case a crew of six men turned out an average of twenty-six crank cases per day. This crew now produces sixty-five cases per day. This production is obtained with the same men, same equipment, and same length of day.

Another case was that of a paper box department in a large textile mill. The manager, who was formerly an expert in paper box production methods, thought his methods and costs were unassailable. Correct time study methods were finally employed and, although all operators were given substantial wage increases, a net saving of $20,000 per year was made.

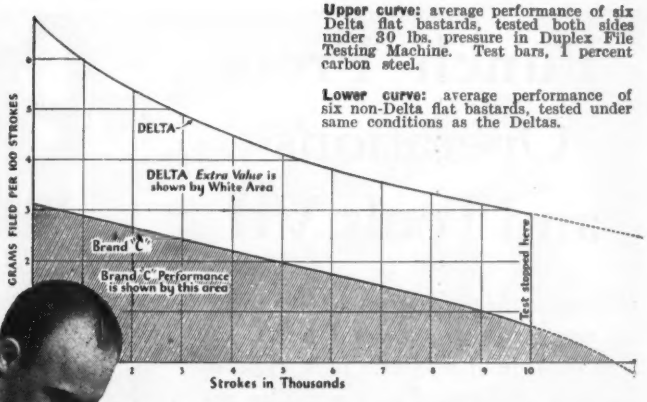
The assembly of a delicate metal office appliance machine, made up of hundreds of parts, was performed by trained assemblers each of whom averaged ten machines a day. Eventually the old time measurement principles in use were discarded for correct time study methods which called for and secured seventeen machines per day without changes in assembly methods. This 70 per cent increase allowed the payment of more money to the skilled assemblers and at the same time the daily output was increased without the impairment of quality in the slightest degree.

There is no excuse for waste—and it can be called nothing else when two men are employed to perform a task that can be accomplished by one, or when a workman takes two hours to complete an operation that can be performed in one.

DELTA

Upper curve: average performance of six Delta flat bastards, tested both sides under 30 lbs. pressure in Duplex File Testing Machine. Test bars, 1 percent carbon steel.

Lower curve: average performance of six non-Delta flat bastards, tested under same conditions as the Deltas.


GRAMS FILED PER 100 STROKES
DELTA
DELTA Extra Value is shown by White Area
Brand "C"
Brand "C" Performance is shown by this area
Test stopped here
Strokes in Thousands

DELTA Economy was never so great

Never before has the ECONOMY of Deltas, in metal removed per dollar of file cost, been so great as now.

For it has never been possible to buy Deltas as so small an increase over the prices of other files as it is today.

The sharp "lance-tooth" Deltas not only bite into metal at a much faster rate, but last longer and remove more metal during the life of the file. Considering either file cost or labor cost, or both together, Deltas are the most economical files you can buy.

The chart shows this. Upper curve shows average Delta performance in the Duplex Testing Machine. Lower curve shows average performance of six non-Deltas of a well-known brand, same size and cut, under exactly the same conditions.

Investigate now the savings to be made in your own shop by using Deltas. You can make a simple bench test with Deltas and your present files. The file that cuts fastest at the start will remove the most metal during its life, and remove it fastest. Ask the nearest Delta distributor for details.

DELTA FILE WORKS

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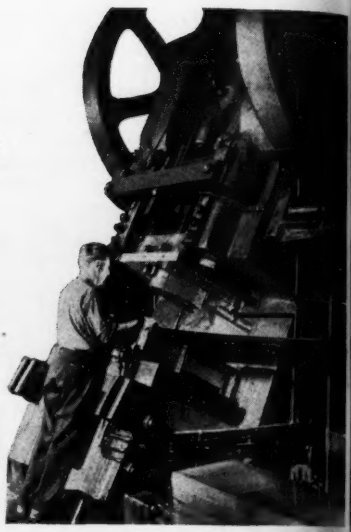
Punch Press Operations and Tools, VII



When a high degree of accuracy is required on stamped parts, the compound die is the best type of punch press tool to use. The important features in the design and construction of a compound die are outlined in this article.

By C. L. Szalanczy,
Tool and Equipment Dept., Westinghouse Electric & Mfg. Co.

COMPOUND dies are of two types; the usual or more-commonly-used type, and the inverted type. Both types have their particular uses and advantages in the production of metal stampings.

The regular type of compound die carries both the male and female parts on both moving and stationary parts of the die. The movable, or upper, member of the die carries the female part for cutting the outside contour of the stamping.

In the production of blanks where the highest possible degree of accuracy is required, from a manufacturing standpoint, the compound die is the best type of punch press tool to use as it makes possible the production of the pierced blank in one blanking operation. In addition, all succeeding blanks are exactly alike, without any variation whatever in the dimensions. In many cases this advantage over the product of the usual progressive types of tools is important, especially when the punched-out blanks are to be used as laminations for built-up assemblies.

In the electrical industry, the greater part of the lamination punchings used are made from sheet metals from 0.014 inch to 1/16 inch thick. Compound dies are used extensively in the production of these punchings as such tools afford the most accurate method of production, although the process is a trifle slower than the process in which the progressive type of piercing and blanking die is used.

The blanks may be kept practically free from burrs if care is exercised, when making the die, to provide exactly the right amount of clearance between the punches and the die parts. For heavier materials, this type of die is the best since the necessary amount of clearance may

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VALVE REFACERS
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be ground on the die part that cuts out the blank. This clearance reduces the strain on the die and makes it possible to cut the heavy material quite easily.

At the same time, it keeps the finished blanks perfectly flat since it is a well-known fact that the metal being cut will adhere to the punch—which in this case is naturally ground flat across the cutting surface. When the progressive type of piercing and blanking die is used

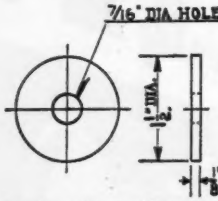


Fig. 1—Drawing illustrating type of blank produced with the compound die shown in Fig. 2.

this result cannot always be accomplished, due to the manner in which the blank is cut and pushed through the die. In the latter case the force is evenly distributed over the entire area of the blank, which tends to bow the blanks somewhat and makes it necessary to follow with a bumping or straightening operation to flatten the blanks.

The drawing Fig. 1 illustrates a simple type of blank, to be made from ⅛-inch cold rolled steel and produced by the use of the compound die illustrated in Fig. 2. The die is of small size and may be set into a regular standard die set, indicated at **A**. The raising plate **B** is of round hot rolled or machine steel, finished on top and bottom and counterbored to a depth of ⅛ inch to provide a seat for the die. This method has been found to have several advantages over that of simply setting the die on the lower side of the raising plate.

The small tool steel punch **C** is press-fitted into the plate **B** and is kept from pulling out, when the blank is being ejected, by the shoulder. This punch is hardened to 80-85 points Scleroscope, but the shouldered end is left soft to keep the punch from working itself into the upper shoe of the die set.

The die part **D**, which cuts the blank from the stock, is of high grade tool steel. The die is made to the blank dimensions where the cutting is performed, and no clearance is provided on this die-piece. The top of the die is machined out on the inside to allow the ejector **E** to move back so that, as the blank material is cut, it may enter the die to a depth greater than its full thickness.

The ejector is of tool steel and is hardened to withstand the constant wear to which it is subjected in service. This ejector is made long enough to extend ⅛ inch down past the cutting edge of the die when the upper and lower members of the tool are not engaged, so as to make certain that the blank is pushed out of the die by the action of the three stub steel knocker pins and the knocker at the top of the die shoe stem. These items are indicated at **F** and **G** in the illustration.

The knocker **G** is actuated by a center knocker bar in the press, set at the correct height to perform its function properly. The ejector is provided with a shoulder, extending completely around it, by which it is suspended in the die. The ejector is made to a close fit in the die, and the hole in the center is also made to a close fit to aid in supporting the punch **C**. Otherwise the punch may break off during the blanking or stripping operations.

The die and raising plates are held to the top shoe by means of filister head screws and at least two dowels. The dowels should be hard-

ened. The punch holder plate **H** and the stripper **I** may be made of round hot rolled steel, the stripper being case hardened. The punch holder plate is made to press fit dimensions for the blanking punch **J** and is drilled to receive the three compression springs that operate the stripper. These springs must be under constant tension, and must have the strength to lift the stripper 1/32 inch above the blanking punch so that the scrap will be stripped off.

The stripper **I** is counterbored ⅛ inch deep on the lower side to allow the springs to be set into place, in line with the holes in the punch holder plate. It is held in place by three filister head screws, and may be adjusted and locked in place by the lock nuts on the bottom. As the punch is ground off, from time to time, the stripper is adjusted downward evenly and the tops of the screws are ground off. The stripper is equipped with two guiding pins **K**, which enable the press operator to keep the blank material always in the correct position for blanking. One of these pins is located in front at the left hand side while the other is in the rear at the right. Thus the operator needs only to keep the material strips in contact with the two pins to make sure that the blanking area is covered.

The blanking punch **J** is of tool steel and has a shoulder turned on the base to give it a larger setting surface, also to keep it from pulling out of the punch holder plate during the stripping period. This punch is hardened in the same manner as the punch **C** and is then ground to the required size (die dimension plus the necessary clearance). The female part in the punch **J** for the male part **C** is made straight for ⅛ inch down from the top and is then tapered back ½ degree on a side to allow clearance for the material slugs to pass through as they are punched out of the blank.

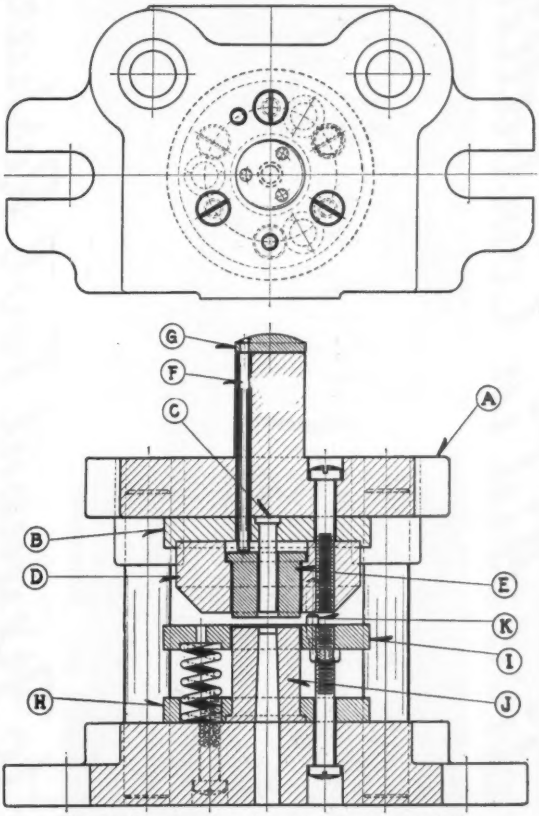
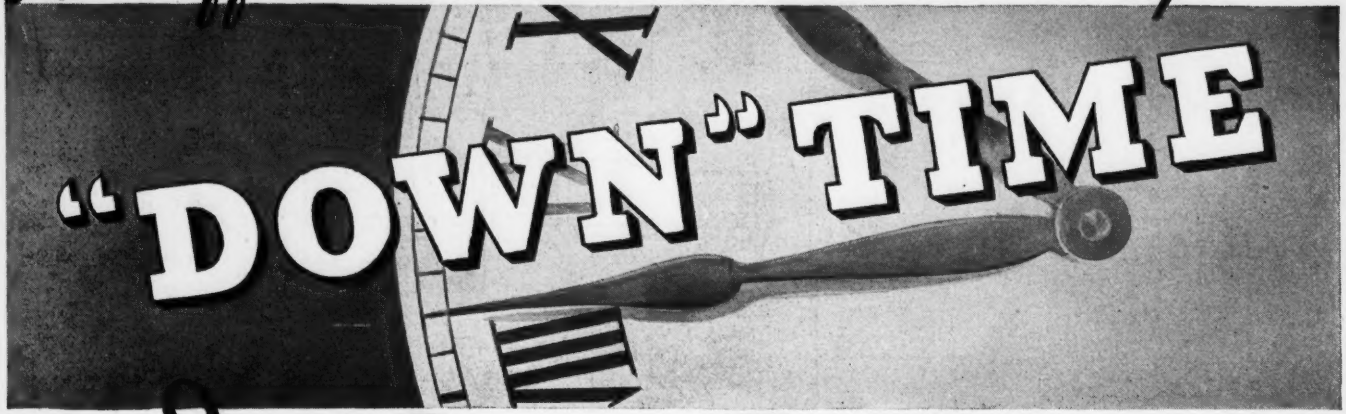


Fig. 2—Cross-section drawing of compound die.

The punch holder plate **H** is fastened to the die shoe with filister

An Effective Aid in Combatting



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to avoid, because operating delays are costly.

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Even at high surface speeds, abrasive wheels stay cool.

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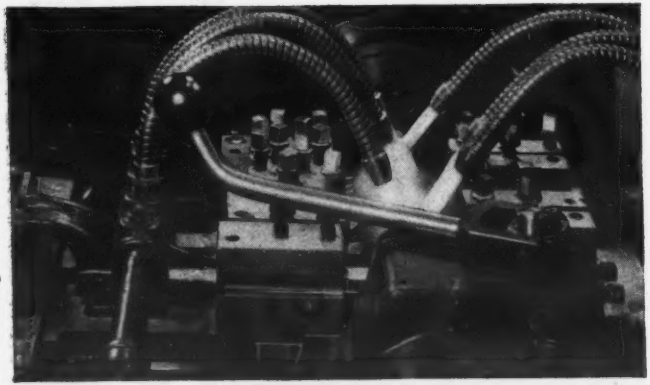
EMULSIFYING CUTTING OIL

Operation: Machining wheel end of automobile axle shaft.
Machine: Monarch "Magnetic" Lathe.
Lubricant: 1 part Sunoco to 15 parts of water.

Courtesy of
Monarch Machine Tool Co.
Sidney, Ohio



Operation: Grinding differential pinions.
Material: Chrome-nickel steel.
Machine: Bryant Hole Grinder.
Coolant: 1 part Sunoco to 40 parts of water.

Courtesy of
Buck & Hickman, Ltd.
London, England

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head screws and dowels. The die shoe is provided with a clearance hole directly under the one in the punch J, to let the scrap punchings

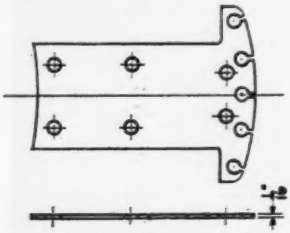

Fig. 3—Drawing of pole punching, illustrating general class of work produced with the larger types of compound dies.

fall through the press table into a pan on the floor.

The pole punching shown in Fig. 3 illustrates the general class of work produced by the larger types of compound dies. There are a number of different types of pole punchings used in the manufacture of an electric motor, of course, but the dies are of practically the same basic design. The blanks are usually made from 0.062-inch M. A. sheet steel, and must be blanked sufficiently perfect so that they will pass a "turn-over" inspection test. At the same time, when building up the poles, they must be kept in the same relative position in which they were blanked out of the sheet material to facilitate the assembling operation.

Occasionally blanks are produced with slight burrs on the edges, and if, in assembling, two of these pieces are assembled so that the burrs on the two pieces face each other, an air gap will exist between the punchings. Consequently it is necessary they be kept together in the same order in which they were blanked out, and to aid in keeping them in this order, a special marker is built into the die to mark the blanks so that they may readily be assembled in the correct position. In cases where there are several dies for blanking the same piece, this marker becomes a very important part of the die since a different character is alloted to each marker and thus the output of each individual die can readily be distinguished from the others. This method precludes the possibility of mixing the punchings in the same assembly.

The method of blanking these punchings is illustrated in Fig. 4. By running the sheet metal through the die twice, reversing it the second time, the blanks partly overlap, as shown, thus saving a considerable amount of material which otherwise would be scrap. Under present-day

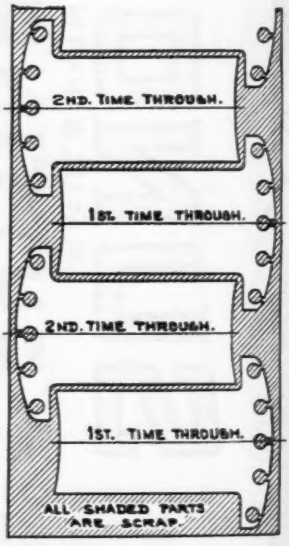

Fig. 4—Diagram illustrating method of running stock through twice to reduce amount of waste.

conditions the saving thus made on material alone might be the deciding factor, if the order were large, in the making of an important sale. Lower manufacturing costs naturally

300

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We showed them with actual demonstrations on their own toughest tapping jobs. They saw the most difficult parts tapped with a speed and accuracy which they had thought impossible. And they went away convinced that Haskins had revolutionized tapping methods.

THE SPEED, PRECISION AND EFFICIENCY of the Haskins Tapper makes old fashioned methods an extravagance. Scores of plants have stepped up their production to the new high speed of Haskins Tappers. Probably you can too. Why not investigate? R. G. Haskins Company, 4667 Fulton Street, Chicago.

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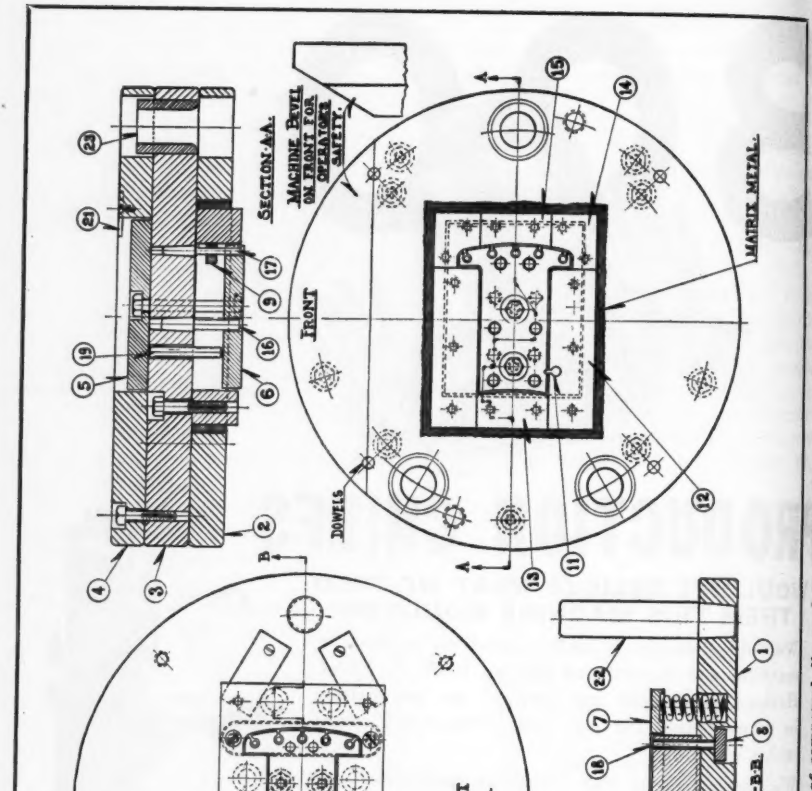


Fig. 5—Design of compound die used to produce the pole punchings shown in Fig. 2.

make possible lower selling prices.

The general design of the compound die used to produce the pole punchings referred to is illustrated in the drawing Fig. 5. The bottom die shoe (1), die ring (2), top shoe (3), and the top plate (4) are all made from hot rolled steel plate, burned out to the circular shape shown in the illustration and ground

on the top and bottom surfaces to assure perfect setting when the die is assembled. On large dies of this type it has been found best to make the shoes round so that they can be rolled for short distances, facilitating handling.

The knocker (5) is burned out of the center of the top plate (4) and is machined to allow movement within the top plate. The strippers (6) and (7) are made from hot rolled steel plate and are ground on one side only. The lower stripper is actuated by springs and is fastened to the bottom shoe by a number of special stripper screws (24). At a point part way down on each of these screws a square is filed so that the screw may be adjusted by the use of a special wrench and lock (20). The wrench is fastened to the shoe with a ¼-inch 20-thread screw after the stripper has been correctly set.

The lower knocker (8) is of cold rolled bar steel and is located in the lower shoe. This knocker holds the stub steel ejector pins (18) which carry the scrap metal up and out of the die. Since in this case the punched-out part is still attached to the main section of the scrap material, it is well to have an arrangement such as this to keep the scrap flat as it is stripped off the punch.

The distance plate (9) is of ¼-inch cold rolled steel and is made to a press fit to align and support the punches (17). The punches are of tool steel, hardened to specifications and ground when the shape permits. Otherwise they are filed to shape and size. The shanks of the punches are tapered for quick setting purposes and are left soft.

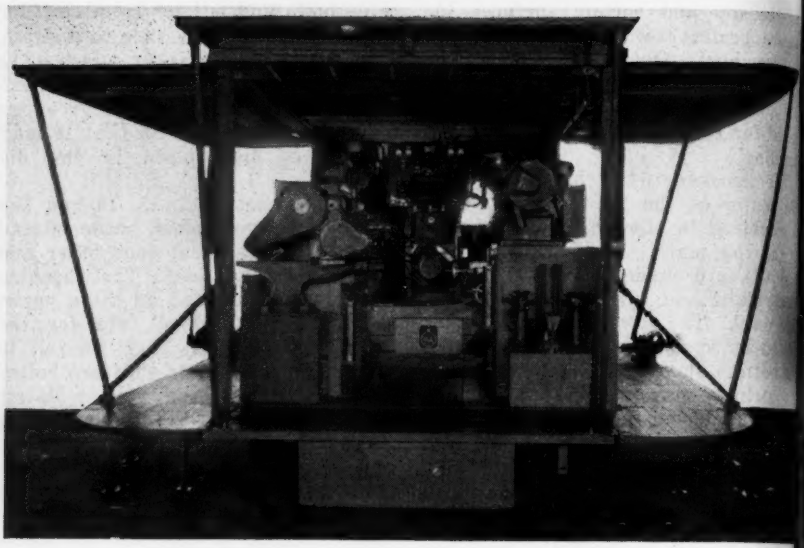
The blanking punch (10), which is also of tool steel, is the female part for the punches that pierce the round holes and slots in the end of the blank. This punch is attached to the bottom shoe with hexagon head machine bolts and is kept from shifting by setting it into the shoe to a depth of ⅛-inch. The marker punch (11) is of tool steel, hardened and indexground to a taper of ¼ degree per foot on the diameter so that it may be pressed into place in the die piece.

The die parts (12, 13, 14 and 15) are of high speed steel, hardened and ground to fit against each other and on the cutting line. The machine finish is good enough on these parts, as it affords a good grip for the matrix metal when it is poured in around the die pieces that are bolted in place in the die ring. Matrix metal has proved its value and is used extensively in some of the larger plants in the production of tools, reducing the cost of the bench work and assembling line. It also eliminates corking around the die pieces and simplifies the making of repairs.

The punches (16) are carried in stock in the standard sizes, and, like the punches (17) are made with taper shanks. The pins (13) for the upper knocker are of stub steel, cut to the correct length and made to slide through the top shoe. The top knocker is held in place by two special retainers (21) which are set into the top plate to a depth of ⅛ inch and are fastened with countersunk head screws.

The guide pins (22) and the bushings (23) are carried in stock and are used to keep the two die parts in alignment. When the die is not in use, it is bolted together, the two members of the die being separated by pieces of gas pipe cut to the correct length and slipped over the tie bolts.

The most progressive manufacturer can give you the best service. The manufacturers represented in these pages are leaders in their industry; patronize them and mention MODERN MACHINE SHOP when doing so. You will benefit.



Rear view of shop showing interior and equipment.

A Complete Machine Shop on Wheels

WHAT is believed to be the largest and most complete mobile machine shop ever designed has just been built by the Marmon-Herrington Company, Inc., Indianapolis, Indiana, for use in the Near East. The unit consists of a Marmon-Herrington Model A30-6 tractor with all six wheels driving and a large semi-trailer in which is contained, in compact and easily accessible form, a full assortment of machine shop equipment of the latest type.

While the Marmon-Herrington Company is not at liberty to disclose the identity of the purchaser, it is understood that the unit is intended for use in maintaining a large amount and variety of mechanical equipment, including some 300 mo trucks, and that it is intended f service in a country which consi largely of a wide expanse of dese Such terrain imposes an unusu hardship upon all kinds of mechani units, especially the motor truc which are in constant, daily ope tion.

In designing the mobile machi shop, the first and most import consideration was that the outfit m be complete and as compact as p sible. The answer to this prob was the tractor semi-trailer machi shop, which is so arranged that tractor can be uncoupled from semi-trailer and a collapsible b normally carried on the rear end

Side view showing mechanics at work. Each side platform serves as a bench.

the trailer, can be assembled and used for wrecking equipment.

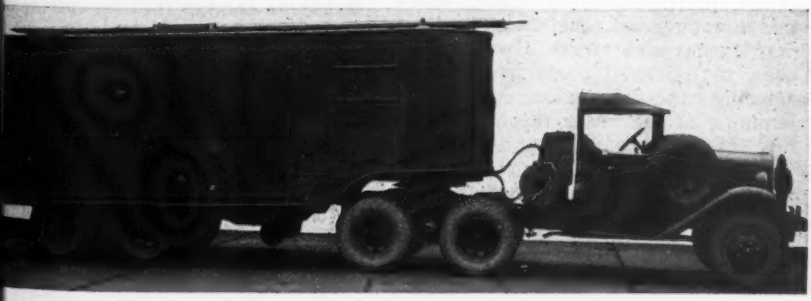
The collapsible body is mounted on the fifth wheel, and when in position, carries all the necessary equipment for wrecking operations including chains, jacks, anchor pins, sledges, shovels, crowbars, block and tackle, and so on. Two spare tires are carried.

The machine shop is complete in every detail. One of the specifications stipulated that the whole outfit must be capable of being disassembled, packed, and made ready for the road within one and one-half hours. All machine tool equipment is mounted within the semi-trailer. An 80x45-foot tent forms part of the equipment and once the tent is erected and the shop opened up, it is ready for business.

The machine shop equipment in the trailer includes a large gasoline-driven motor generator set, a large capacity air compressor fully capable of operating a riveting hammer and supplying air for heavy duty operations, a water pump and storage tank, an electric welder, heavy duty drill press, universal milling machine, heavy duty lathe, bench grinder, bearing press, portable blacksmith

(Continued on Page 52)

The Marmon-Herrington Mobile Machine Shop unit ready for the road. When the sides are opened, the trailer becomes a fully equipped machine shop.



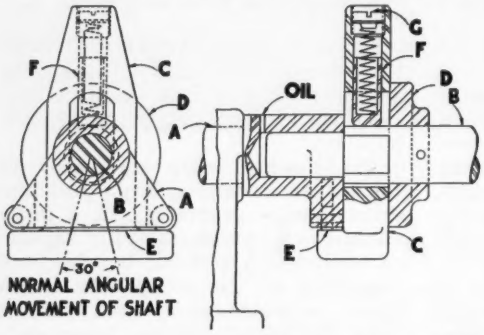
IDEAS FROM READERS

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Overload Relief Mechanism For An Oscillating Shaft

By J. E. Fenno

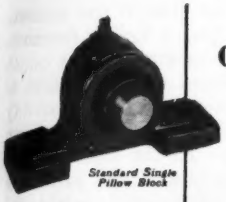
A simple yet effective overload relief mechanism is adapted to a reciprocating shaft in an automatic machine for spinning electrical switch parts. This shaft actuates a slide of a double-column magazine which feeds the parts alternately to two synchronized dials between which the magazine is located. With this arrangement, the slide feeds a part during each stroke. Owing, however, to damaged parts accidentally entering the magazine, occasional jamming of the latter results. Therefore, in order to prevent damage to the mechanism, the latter is designed so that the slide instantly eases its movement against the jammed part. This overload relief is incorporated on the oscillating shaft which actuates the slide and which is shown in the accompanying illustration.



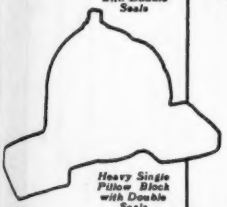
Design of Overload Relief Mechanism for an Oscillating Shaft

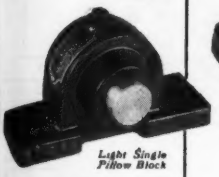
The oscillating shaft has an angular movement of 30 degrees. It is indicated at A and is oscillated by the drive shaft B. Connection between both of these shafts is established by the member C, which is a sliding fit on flats machined on shaft B. Member C is retained in its position vertical to the shaft's axis by the collar D and the end of shaft A. This shaft end is of triangular shape, two corners of which are provided with rolls that ride upon the flat shelf E of member C, the shelf being held normally against the rolls by the plunger F. Plunger F is backed up by a coil spring the tension of which may be adjusted by screw G, to vary the pressure required to operate this overload relief.

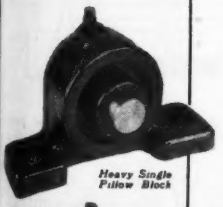
The mechanism is shown in its normal operating position, both shafts oscillating as one. However, should a part jam in either one of the magazine columns, the feed slide will return to feed a part from the other magazine column into its corresponding dial. This dial only will continue to be supplied with parts until the damaged part has been removed. This action is explained as follows: Assume that the click jams when the shaft A is rotating in a clockwise direction. Shaft B being positively driven, it will complete its oscillation in this direction; but shaft A will stop. Consequently the left-hand roll will force the member C to slide downward on


Standard Single Pillow Block

Standard Double Pillow Block with Double Seals

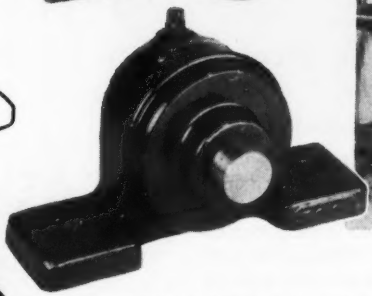

Heavy Single Pillow Block with Double Seals

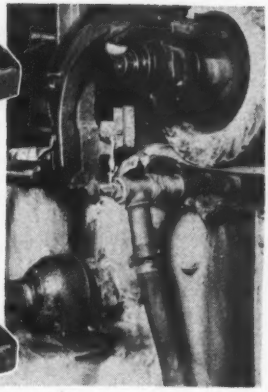

Light Single Pillow Block


Heavy Single Pillow Block

Standard Double Pillow Block

GAIN "*Uninterrupted Operation*" WITH THE RIGHT FAFNIR FOR EACH SERVICE





More than 40 Fafnir Ball Bearings are in use at the Holyoke plant of the American Writing Paper Co. The couch roll application shown here is merely typical of the many places where American Writing Paper has found that the right Fafnir can, almost more than any one other factor, save power costs and make for economical operation.

Fafnir Single and Double Row Pillow Blocks, Radial and Thrust Ball Bearings, Wide Inner Ring Bearings and other types all find service in this modern paper factory. Because bearings in paper mills take unusual punishment not only from ordinary moisture in the air but also from direct hose streams . . . and grit and dirt as well . . . Fafnir Double Sealed Pillow Blocks are depended on to make possible the "uninterrupted, trouble-free operation" required of machinery that makes high quality papers.

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FAFNIR BALL BEARINGS

shaft B, while the right-hand roll leaves shelf E.

On the return of the shaft B to the center of its oscillation, the rolls will again assume the position shown, and shaft B will complete its oscillation with shaft A so that the feed slide operates in conjunction with the unjammed magazine column. The shaft members then return in reverse order. As soon, however, as the jammed part is removed, both rolls remain on shelf E during the entire cycle so that both shafts again rotate as one. Accordingly, the full feeding movement is imparted to the slide and the parts are fed alternately from both columns of the magazine.

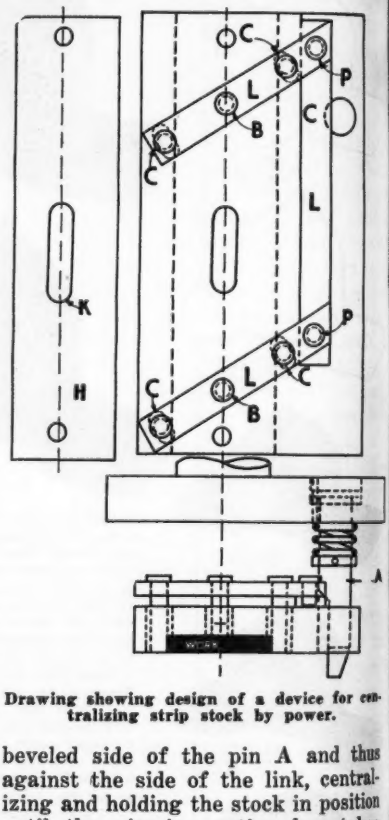
Centralizing Strip Stock by Power

By Charles Kugler

THERE are several methods used for centralizing strip stock when the material is heavy, in practically all of which the operator is required to hold a handle or lever with either one or both hands so as to compel him to keep his hands out of the danger zone. This device is employed when the press is operated by foot. But in the freight car repair department of a western railway shop the presses are so arranged that they are tipped by hand, the hands being used at the same time to operate a device for centralizing the stock.

To the stripper are attached the three links L, which are connected by the two pins P. The end links swivel on the pins B, which are located on the center line of the stripper. These end links carry the four hardened pins C, which swing on a radius as the links are moved, clearance slots being cut in the stripper for the pins as shown. These four pins C guide the stock, centralizing it when the links are actuated by the cam action of the pin A, which strikes the side of the connecting link as the punch holder descends.

The pin A is located in the punch holder, but instead of being rigid, is given a certain amount of flexibility by the use of the heavy spring shown in the drawing. As the ram descends on the down stroke of the press, the spring exerts pressure against the

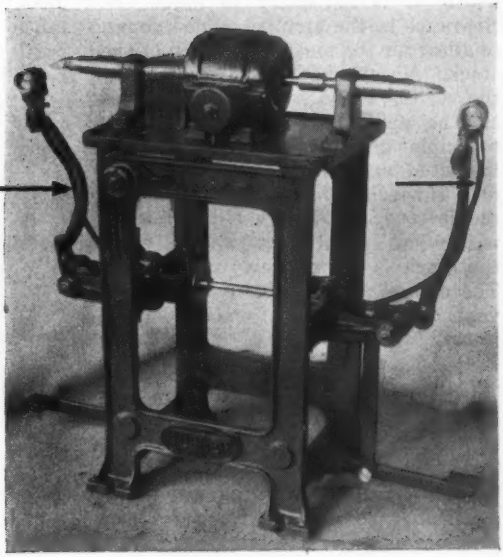


Drawing showing design of a device for centralizing strip stock by power.

beveled side of the pin A and thus against the side of the link, centralizing and holding the stock in position until the piercing action has taken place and then releasing the stock on the upstroke of the press. Thus the device automatically centralizes the stock with respect to the die, leaving the operator's hands free to trip the press.

When the stock used varies in

S. S. WHITE FLEXIBLE SHAFTS



help to give hats a "hair cut"

The machine illustrated, is a product of the TURNER MACHINE CO., INC., of Danbury, Conn., inventors and builders of hat machinery.

Its function is to give specially prepared hats a "hair cut", utilizing clipper blades to trim the fibers on the surface to a uniform height.

Hats are supported on the feeder rollers at the right and left. These rollers are driven at a uniform rate by means of S. S. WHITE Flexible Shafts connected to the countershaft.

The flexible shaft is certainly the simplest solution to the problem of driving the rollers, since they are mounted on swinging arms. This is but one of many similar driving problems to which the flexible shaft is the simple, effective answer.

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width, it is necessary to make the clearance in the stripper wide enough to allow for the maximum width of the stock. No attempt has been made by the writer to show how this device can be applied to special jobs; the principle only is described and illustrated and the application of the idea to special conditions is left to the die designer. At H in the drawing the writer has shown what happens when the stock is not properly centralized. The device described here would prevent the possibility of such a condition.

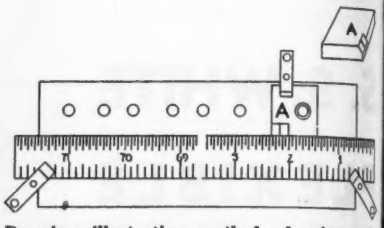
Accurate Spacing of Drilled Holes

By K. C. Charles

IN DRILLING holes on a straight line, where the ordinary scale measurement is sufficiently accurate, the writer has used the method outlined here with entire satisfaction. The method is fast and accurate, and can only be exceeded in these respects by a templet or jig.

All that is needed is a scale of a length equal to the length of the work (one is usually included in the toolroom equipment), three clamps, and a small block made to the design shown at A in the drawing. The block has a bevel on one side, in which a line is inscribed, as shown, and is drilled and reamed to guide the drill. If there are a number of jobs of this type, a set of slip bushings can be made up to fit the hole in the block so that drills of various sizes can be used. If bushings are to be used, the block can be made of cold rolled steel; otherwise it should be of tool steel and hardened.

To use, the scale is clamped parallel with the line upon which the holes are to be drilled, then the block is moved along the edge of the scale until the line in the block coincides with a given line on the scale. The block is clamped in position and the hole is drilled. The block is then moved the required distance and the operation is repeated until the required number of holes have been drilled. If a magnifying glass is used to split the lines, an accuracy can be obtained equal to that of the scale.



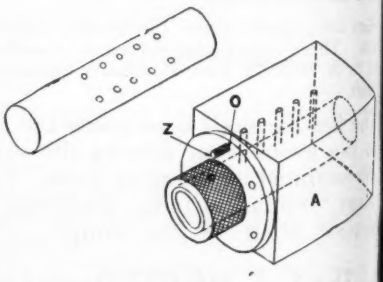
Drawing illustrating method of using scale and jig-block to drill holes on a straight line.

A Simple Indexing Jig

By J. E. Moore

AMONG the parts that are used in the construction of a certain make of airplane is one which consists of a section of round steel tubing in which are drilled five parallel rows of holes with five holes in each row, as shown at the left.

To drill these holes accurately and economically an indexing jig, shown at the right, was made. The principal part of the jig is a tool steel block A through which a hole was drilled



A Simple Indexing Jig

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and reamed to hold the tubing, the tubing sliding through the block lengthwise. Five holes were drilled in the top surface of the block, of the correct size and correctly spaced, as shown. To index the tubing, an indexing plate was made, the plate having a hub in which a hole was drilled and tapped for a setscrew. The five locating holes in the index plate were drilled with the aid of an index head so as to be accurate.

A hole was drilled in the block A for the indexing pin Z, the proper location being obtained as follows: A section of tubing was placed in the block and the index plate was placed in position over the end of the tubing. The set screws was tightened. The hole was then drilled into the block, using one of the five holes in the plate as a templet.

In operation, the piece of tubing is clamped to the plate by means of the setscrew and then the pin O is used to locate the five positions in turn.

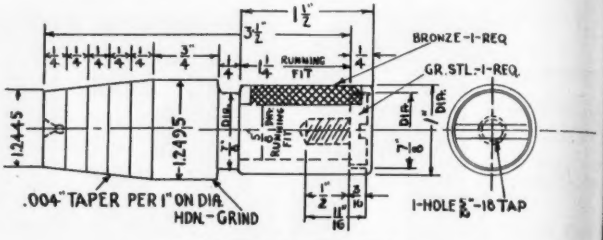
Graduated Plug Gage

By Edw. L. Robenolt

OPERATORS of internal grinding machines and supervisors of grinding departments will appreciate the value of the graduated plug gage illustrated in the drawing. The dimensions given on the drawing apply to a given job in the manufacture of our product but these dimensions can, of course, be adapted to any job.

The principal feature of the plug is that it can be used to gauge a hole without the necessity of stopping the machine, and as such gauging often is repeated several times when the hole is very nearly to size, the time saved by the use of such a plug is immediately apparent.

The plug illustrated is made with a taper of 0.004 inch in 1 inch, or



Graduated Plug Gage

0.001 inch for each ¼-inch of length. The handle is ground to a diameter of ⅝ inch to receive a bronze shell that is knurled so that it can be held easily while the plug is revolving. A 5/16-inch screw with a ⅞-inch head holds the shell on the handle.

Check Your Settings, Too

By R. P. Brown

RECENTLY a machine tool manufacturer who is particular about the precision of his work reported difficulty in maintaining settings. He had Timken bearings on his work spindle, and so called on the Timken company to analyze and correct his difficulty. It was unusual, but a service man was sent out to check over the situation with the manufacturer's chief inspector.

The inspector said, and demonstrated, that when he tapped the spindle lightly with a lead hammer to center the work in the chuck, the setting changed. The indicator gauge was mounted on a very heavy casting not connected with the machine. Checking the bearing failed to indicate any possible source of difficulty.

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Even though the machine which was giving trouble weighed nearly 3,000 pounds, the Timken representative had the inspector tap the base of the machine just as he had tapped the spindle. It seemed ridiculous, but the indicator showed the same result. Several trials proved that, so delicate was the indicator, and so accurate the spindle setting, even a light tap on the machine itself was sufficient to disturb the setting of the whole machine.

When the machine was firmly fastened to the floor, even though it seemed too massive to require anchoring, the trouble disappeared. Using wedges alone to line up a heavy machine is not always sufficient, and this unusual incident serves as an example of the importance of investigating even remote possibilities when unexpected manufacturing difficulties seem to be developing.

"Mental Gymnastics" Discussion

By Horace W. Leet
Prof. Machine Design, University of Rochester

THE method of handling fractions as discussed by John E. Hyler in the January issue of MODERN MACHINE SHOP seems rather cumbersome compared with a short-cut method I frequently use. Back of this method there is a foundation based on algebraic equations, but that need not complicate the practical use of the method.

The whole story is tied up in the relation $a\ (b \pm c) = ab \pm ac$. This is read "a times b, plus or minus a times c."

A mixed number is easily reduced to the $b \pm c$ form. For example, the number $3\frac{5}{8}$ used by Mr. Hyler. To halve this, a is $\frac{1}{2}$, b is 3 and c is $\frac{5}{8}$. The product is easily seen—$1\frac{1}{2}$ plus $\frac{5}{16}$. Even that is more easily solved when b is $3\frac{1}{2}$ and c is $\frac{1}{8}$.

To take another of Mr. Hyler's examples: Multiply $4\frac{7}{16}$ by 3. 3 times $4\frac{1}{2}$ plus 3 times $\frac{1}{16}$ gives us immediately $13\frac{1}{2}$ plus $\frac{3}{16}$, or $13\frac{11}{16}$. To divide by 3, multiply by $\frac{1}{3}$. The product is equal to $\frac{1}{3}$ of $4\frac{1}{2}$ plus $\frac{1}{3}$ of $\frac{1}{16}$, or $1\frac{1}{2}$ plus 1/48, equalling 1 25/48.

If the number were $4\frac{7}{16}$ instead of $4\frac{9}{16}$, the process would be changed slightly by putting the number in the form $4\frac{1}{2} - \frac{1}{16}$. Then the division by 3 would give $1\frac{1}{2} - 1/48$, or 1 23/48.

When numbers such as $25\frac{3}{16}$ are to be divided by 3, the process is just as simple. The set-up is $\frac{1}{3}$ times 24, plus $\frac{1}{3}$ times $1\frac{3}{16}$, or 8 plus 19/48, equalling 8 19/48.

A Complete Machine Shop on Wheels

(Continued from Page 43)

shop that can be removed and set up near by, valve refacer, vulcanizing plant, and an assortment of small tools such as drills, taps, reamers, dies, machinist's tools, everything, in fact, that might be required.

Whether the activities are for war or for peace, mechanical equipment cannot long be continued in operation without the help of the machine shop. And if the job cannot be brought to the shop, the shop will be taken to the job.

CHAPMANIZING—A NEW HARDENING PROCESS FOR LOW CARBON STEELS: According to this folder, which is being issued by the Wesley Steel Treating Company, 1321 West Pierce Street, Milwaukee, Wis., "chapmanizing" is a newly discovered, fast, and economical process for producing an extremely hard wear resistant case for low carbon steels. The folder describes the characteristics of the chapmanizing process, tells how the process is handled, and includes a diagram which illustrates the rapid penetration obtained in the chapmanizing process as compared with other well known case hardening treatments. Copies gratis.

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Over the Editor's Desk

Waste

THE article by R. W. Shumard, on page 24 of this issue, touches upon a subject that has come in for a considerable amount of discussion during the past few years. The criticism that has been voiced in regard to the use of time- and labor-saving machines and devices and the application of time-saving methods has raised a question in the minds of many of us as to just how far we should go in the development of these machines and the application of these methods. There is but one sensible answer; we should go as far as we can.

As Mr. Shumard says in his article, there is no excuse for waste. The idea of using a slower machine, or of eliminating the machine altogether, in order to provide more jobs of hand-work, if applied consistently, would spell disaster for civilization. Carried to its ultimate conclusion, it would mean the scrapping of all labor-saving devices and the substitution of hand labor entirely. To all intents and purposes we would be turning the clock back several hundreds of years. And what a howl would rise to Heaven.

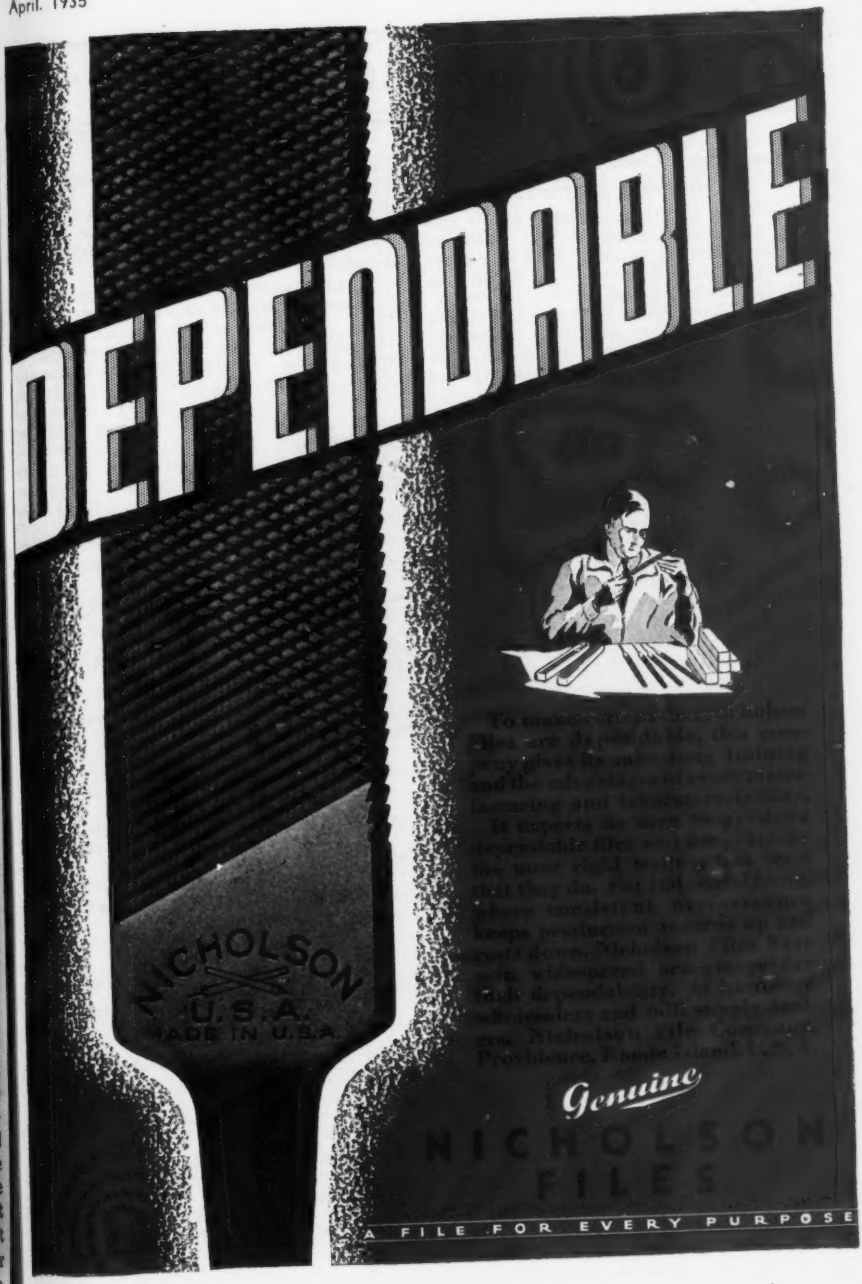
Those who have agitated loudest against the machine would be the first to complain. The elimination of the machine would mean, to the average person, the elimination of machine-made clothing, the electric refrigerator, the automobile—in fact, the elimination of thousands of commodities and conveniences which we have come to regard as every-day necessities.

No longer would it be possible for men to live miles away from their work; automobiles would be so high-priced as to be available only to the very wealthy. The same would apply to the radio. Letters would be written by hand instead of by the use of the typewriter. The telephone would be so much of a luxury that its use would be confined to business and a comparatively small number of homes, if, indeed, it were possible to manufacture it at all.

Only those whose capacity for thought is limited will advocate a return to the hand methods of the middle ages. Thanks to the machine, the working day has been reduced from the twelve hours of grandfather's time to approximately eight—sometimes less—and wages have been increased from the dollar or dollar and a quarter that grandfather drew for his day's work to the scale that prevails today.

The intelligent thing to do is not to abolish the machine, but to make the fullest use of the machine for the benefit of everyone concerned. To advocate taking two hours to perform a task that can be performed with the aid of tools in one hour is to question the intelligence of the race. A man who was building his own home would regard as unreasonable—if not humorous—a suggestion that he carry his bricks to the job by hand instead of using a wheelbarrow. Such a waste of time and effort would be considered the height of folly. Yet the suggestion has been made, in all seriousness, that employers adopt wasteful methods and thus prolong the tasks in order to provide employment for more people.

Such a procedure is nothing more nor less than charity in disguise. The American people don't want charity; they want an opportunity to make use of the ability and intelligence with which nature has endowed them. We have been stymied for the past few years—not because the intelligent use of tools has turned out to be a curse—but because we haven't applied the benefits of those tools for the good of the population as a whole.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NEW SHOP EQUIPMENT

Morton High Duty Draw-Cut Flash Trimming Machine

The High Duty Draw-Cut Flash Trimming Machine shown in the illustration has been developed by the Morton Manufacturing Company, Muskegon Heights, Michigan, especially for trimming the flash from butt-welded sheets having seams up to 120 inches in length.

The machine follows, in design, the Morton patented feature of a vertical moving ram-carrying member which raises the upper ram and clamping dies 2 inches vertically for ease in entering and removing the work. The upper ram is raised and lowered by roller bearing eccentrics. Hardened steel-lined dies are secured to the ram housing member and the rams and cutting tools travel in the path parallel with the hardened die surfaces. The upper ram is provided with automatic compensation to take care of any variation in the thickness of the metal, permitting the trimming of 20 or 15-gauge metal without any change in tool set-up.

Morton High Duty Draw-Cut Flash Trimming Machine

Power is applied to the two reciprocating rams by means of a direct-connected reversing type motor. A built-in worm gear reduction applies the power directly to the rack teeth cut in the sides of the ram by means of a vertical pinion. The cutting and return speeds are approximately 60 feet per minute. A series of cutting tools, each of which is securely fixed in the ram by patented adjustable tool holders, is used. The tools are adjustable, are of the bit-type and very long tool life is assured.

A unique feature of the machine is the die cleaning and centering method. With the semi-automatic operation of the machine, the work unclamps as soon as the cutting rams reach the inward position and the work can be removed while the rams are returning to their initial positions. To insure the dies being free from dirt, a special electrical timing device is applied which operates a solenoid valve, blowing a blast of air across the dies. This operation is not performed, however, until after the rams have reached the outer position. The blast of air is accurately timed and is adjustable to operate for periods of from five to ten seconds.

It is necessary to center the sheet very accurately with the die, and for this purpose a special solenoid-operated centering and lighting device is used within the upper ram.

Footburt Single Slide Vertical Hydraulic Surface Broaching Machine

To the line of Duplex and Continuous Broaching Machines made by the Foote-Burt Company, 13000 St. Claire, Cleveland, Ohio, has been added the Footburt Single Slide Vertical Hydraulic Surface Broaching Machine illustrated herewith.

The machine is simple in design and can be quickly and easily adapted for a variety of work as only the fixture and broach holder need to be changed. On plain flat surfaces often the fixture

only need be changed, as the broach can be designed to handle several different parts. The cutting stroke of the broach is adjustable for length by simply moving the stop dog on the broach slide, so a wide variety of parts may be handled on this machine.

The usual "Footburt" sturdy construction prevails throughout this machine. The base, table, and column carrying the broach slide are tied together making practically a single part. All of these parts are well ribbed in order to provide strength to take the cutting strain of broaching and prevent vibration.

While this machine has been designed with the idea of making it interchangeable for various parts, high production can be obtained on small parts with limited surface area by stacking two or three pieces in a fixture and using one broach, or by placing pieces side by side and using two or three broaches side by side in the broach holder.

As an example of production, on a machine which might have a down-cutting stroke of 8 seconds and an up-stroke, or return, of 4 seconds, the total time per piece would be 12 seconds, amounting to a production of 300 strokes per hour, or 300 pieces. During the up-stroke, one piece would be loaded and by using that time to load two pieces, a production of 600 pieces per hour would be obtained. If the pieces are of the type that can easily be loaded and unloaded, 3 might be broached at a time, providing a production of 900 pieces per hour.

In using the machine, a part is placed in a holding fixture on the table of the machine and the operator throws a lever located at the front right side of machine which pushes the table into cutting position. As the table arrives at this position a valve is automatically opened, starting the broach slide down and, as soon as the broach has passed its work, the table is automatically returned to its loading position by cam movement. The broach slide then returns to its starting position. The reciprocating movement of the broach slide which carries the broach holder and broach is accomplished by hydraulic pump, driven at a constant speed by a constant speed motor through Vee belts.

The broach slide to which the broach holder is bolted is of massive construction with heavy sections and extremely long bearing surfaces. The slide moves up and down on long, wide, square ways supported at every point throughout its entire length. The hydraulic plunger is fastened directly to the lower end of the slide.

The broach is heavy back-type construction and is unusually long. It is held in its holder on the slide, making practically one solid piece and eliminating vibration. When necessary to sharpen, the broach is removed by withdrawing a few socket head cap screws and may be quickly re-assembled in the locating groove on the broach holder. The broach holder is bolted securely to the broach slide and forms a part of the special tooling, all adjustments on the broach being made in the broach holder. The holder is keyed in place on the slide and, in changing from one

Footburt No. 22 Single Slide Vertical Hydraulic Surface Broaching Machine

job to another, it is only necessary to bolt the holder in place.

The machine base forms a large coolant tank and the front platform may be tilted up for easy removal of the chips. The chip compartment is in the center of the base below the broach so that all chips fall directly into it.

The column houses the cylinder, hydraulic pump, valves and all piping. The cylinder is mounted between the ways and the cylinder head forms the top of the column. All hydraulic parts are easily accessible through large openings in the right side of the machine.

Work holding fixtures are mounted on a sliding table. The fixtures are designed for each individual job so that the work can be supported at the correct points and to provide anvil and back-up support in proper location to control cutting pressures.

A very simple and effective lubrication system is provided. The pump runs in oil, and pump drive shaft bearings and the broach slide are automatically lubricated from hydraulic system. An abundant supply of coolant is delivered to the work and broaches by a centrifugal vane-type pump which is driven by an individual motor assembled on the pump frame. The pump is located in the coolant compartment and never requires priming.

This machine is furnished in two sizes, the No. 22 having a capacity of 5-tons and being driven by a 10 h.p. motor. The No. 23 has a capacity of 10-tons and is driven by a 20 h.p. motor.

Cincinnati 10-ft. All-Steel Shear

The Cincinnati Shaper Company, Elam & Garrard Sts., Cincinnati, Ohio, has recently added to its line of All-Steel Shears a smaller series of machine than heretofore built, with capacity for shearing 10 gauge mild steel in 8-ft., 10-ft., and 12-ft. lengths. The illustration shows the 10-ft. shear.

The general design of the shear is the same as in the heavy all-steel shears manufactured by this company. The main frame, table and crosshead are cut from heavy rolled steel plate; hydraulic hold-downs with plungers are spaced at 12-inch centers, developing a pressure of approximately 2,000 pounds each; the five-jaw clutch is totally enclosed and runs under oil. In addition there is a friction slip or clutch for the flywheel rim as overload protection. The characteristic features of this shear are the low rake of the knives, which

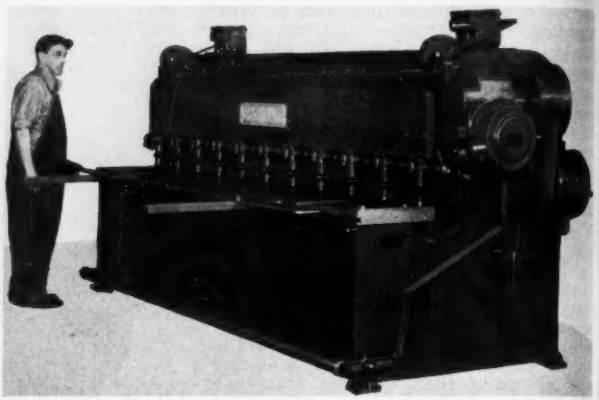

Fig. 1—Cincinnati 10-Foot All-Steel Shear.

is 5/16 inch to the foot; four-edge solid knives; and a speed of sixty strokes a minute.

Standard equipment includes the knife guard, automatic lubricating system, side gauge, front gauge with extension arms, and ball bearing universal back gauge, adjustable from one point with a dial reading to inches and sixty-fourths.

The shear is regularly furnished with a 6-inch throat in the housings. Larger sizes of Cincinnati All-Steel Shears are available with deeper throat for slitting wide sheets. The illustration Fig. 2 shows a slitting gauge by which long sheets can be cut on a short shear in two or more operations as accurately as with a single cut. With this equipment it is impossible to see where the successive cuts start. The illustration also shows the three-button control to the motor, the third being an inching button for operating the shear when setting the knives.

The electric lights shown in this il-

Machined Parts in 3 DAYS

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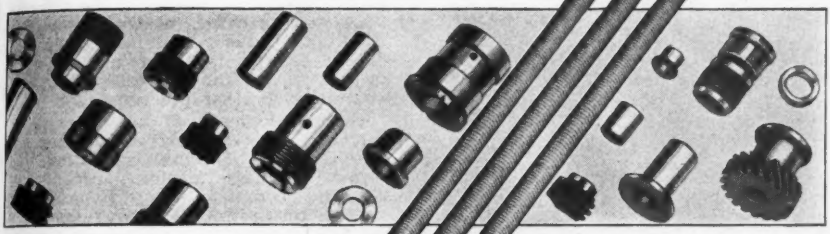

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Using Permite Bars on a screw machine or turret lathe, you can turn out finished parts in 3 days instead of 3 weeks. You eliminate patterns, core-making, molding, and cleaning. You save stock, too, for in Permite's entire six feet of length, you need scrap only the one stub end used for chucking.

Permite Bars are in stock for immediate delivery. Available in all standard bronze alloys, 6-foot lengths, 5/8" to 2" diameters, by sixteenths, and special sizes within this range. For general bearing use the alloy of 83% copper, 7% lead, 7% tin, and 3% zinc is desirable.

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SPEED LENGTH
6 FT. LEADED PHOSPHOR BRONZE BARS

JOSEPH T. RYERSON & SON, Inc. *Plants at:* Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

RYERSON METAL SERVICE

lustration are for the illumination of the table of the machine, but in addition are so placed and focused that they afford a unique method of shearing to a scribed line on the sheet, all that is necessary being to place this line on the bright edge of the light beam and

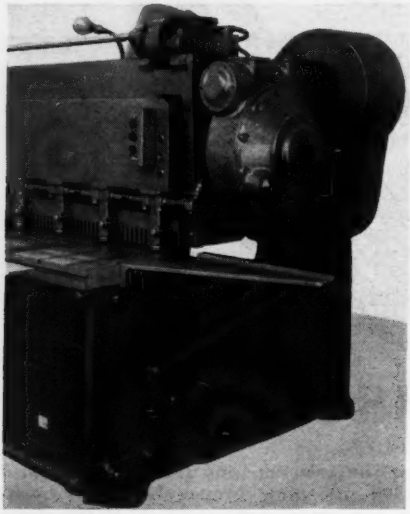

Fig. 2—This view shows the slitting gauge for use in cutting long sheets. The three-button motor control is also visible.

avoid the usual difficulty of the operator sighting the position of the sheet from the end of the shear, or from the top of the table.

Extreme accuracy with high production, low maintenance cost and longer knife life are the advantages claimed for this equipment.

"SIP" Hydroptic Jig-Boring and Milling Machine

Through their American agents—Triplex Machine Tool Corporation, 127 Barclay St., New York, N. Y.—the Societe Genevoise D'Instruments De Physique, Geneva, Switzerland, is offering the "SIP" Combined Jig-Boring and Milling Machine shown in the illustration. The machine, designated as the "Hydroptic", Size A, is especially designed for precision production work as well as for the manufacture of jig, fixtures, and other precision tools.

The development of the machine is said to make available the following advantages: (1) a combined boring and surface milling machine capable of finishing complete the machining of work-pieces with the known accuracy of "SIP" jig-boring machines and without the use of any jigs or fixtures; (2) a reduction of the time required for locating centers and aligning work over older methods; and (3) a reliable measuring system unaffected by wear resulting from the heavy stresses incidental to milling work, ensuring the continuance of the initial accuracy.

In order to provide the features enumerated above, the designers of the machine replaced the measuring lead screws, successfully used on other types of "SIP" jig-boring machines, with a standard scale which, being sighted through a microscope built into the main castings of the machine, is not subject to wear. A measuring lead-screw could not withstand without damage the heavy stresses imposed upon it by heavy milling. The new measuring system permits settings to be made in a minimum of time.

Considerable saving in setting time is assured by hydraulic traverse of the table—which is obviously the most efficient solution. The drive provides in-

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. . . have least number of parts . . . simplicity is the essence of GOOD DESIGN.
. . . have no packing nuts to leak, consume power or require adjustment.
. . . have no foot valves nor relief valves . . . you save the cost of these parts.

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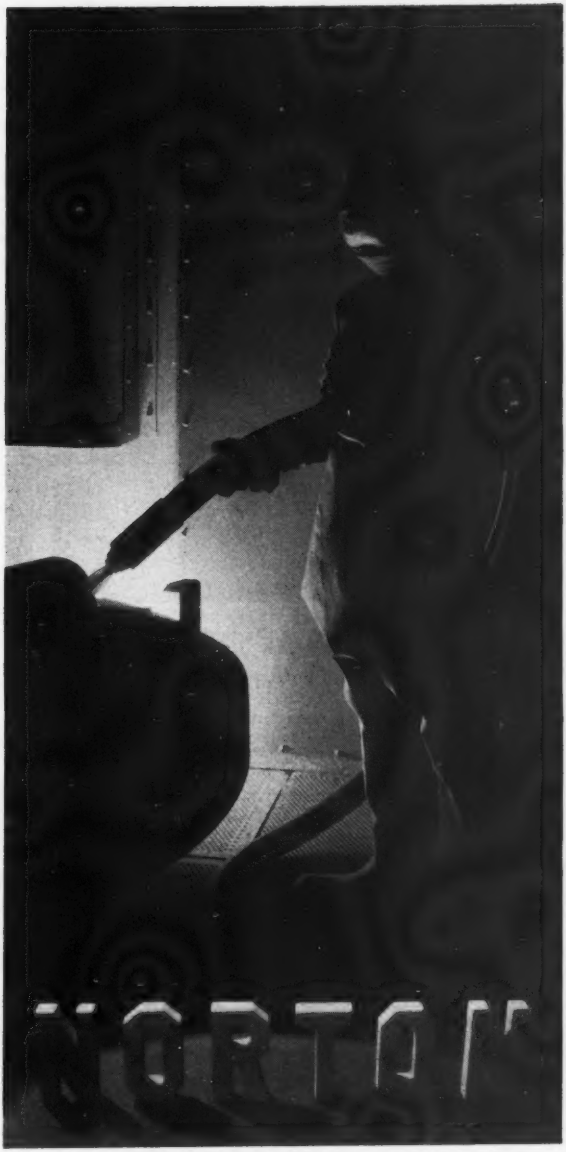

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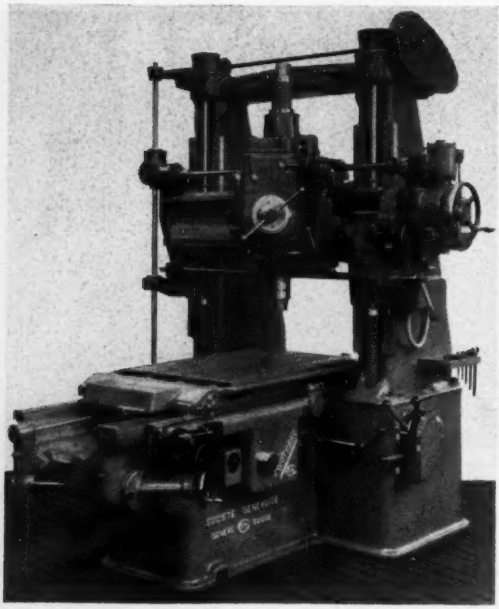


Hydroptic Size A Combined Jig-Boring and Milling Machine

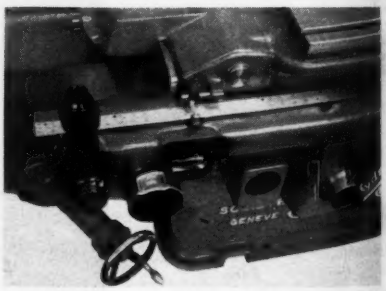
stantaneous and wide variations in speed between 0.2 and 80 inches per minute. The spindle head is of rigid construction, with a 10-inch feed range. The feed is operated either by power, with 6 feeds down and 6 up, or by rapid and slow hand feed. The tools are inserted or extracted by means of a draw-in rod operated from the spindle nose, thus enabling the operator to change tools from his working position. The cross motion of the spindle head is controlled by a combination of a very rapid hand drive with an electrical power drive, the latter being used for milling purposes while the former provides quick traverse. Both drives are always in mesh, and available without selection; thus when milling a casting with bosses to be machined, the spindle can quickly be traversed from one boss to the other by turning the handwheel and without disengaging the power drive. A slow hand feed is always in mesh for setting purposes.

All clamps are controlled from the operating side of the machine. The table is locked to the bed during boring. A single lever operates a self-compensating clamp for locking the spindle saddle on the cross-rail and another lever operates a clamp for locking the cross-rail to the uprights. The vertical motion of the crossrail is actuated electrically, safety devices preventing operation of the rail until the locks on the uprights have been released. To exclude dirt and to maintain their accuracy, the screws controlling the vertical motion are entirely enclosed.

The working surface of the table is 39½x27¾ inches, and the distance between the uprights is 35½ inches. Distance from boring head to work table, from 8 inches to 28 inches. Longitudinal travel of table, 37 inches. Speeds range from 0.2 to 2 inches per minute for coarse setting from 1 to 5 inches per minute for milling work, and from 5 to 80 inches per minute for rapid traverse.

The transverse travel of the spindle saddle is 24 inches; spindle-quill travel, 10 inches. Spindle speeds (18) from 40 to 1250 r.p.m. Spindle feeds, from 0.0016 to 0.01 inch per rev. of spindle. Driving power required, 4 h.p. Vertical displacement of cross-rail operated by power drive, 20 inches.

Reading on reference scales, 0.1 inch. Reading on microscope drums, 0.001 inch. Reading on verniers of same, 0.0001 inch. Reading of angle on circular table, 1 second. Floor space required, 93x108 inches. Total height of



Close-up view of table setting and hydraulic controls with table microscope in working position.

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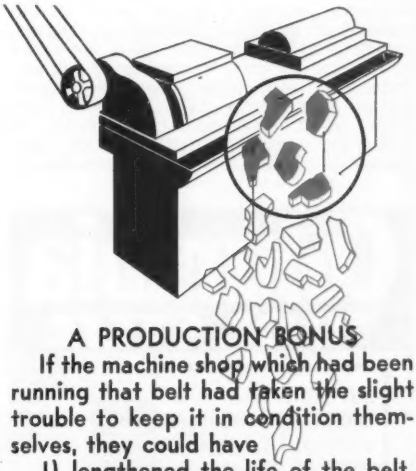
With a few minutes work, we had increased productivity 9%.



A PRODUCTION BONUS

If the machine shop which had been running that belt had taken the slight trouble to keep it in condition themselves, they could have

1) lengthened the life of the belt,
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3) used power otherwise wasted,
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BETWEEN THE POWER AND THE WORK - - LIES THE *BONUS ZONE* - -

1606

machine, 104 inches. Net weight, without accessories, 4 tons 17 hundredweight.

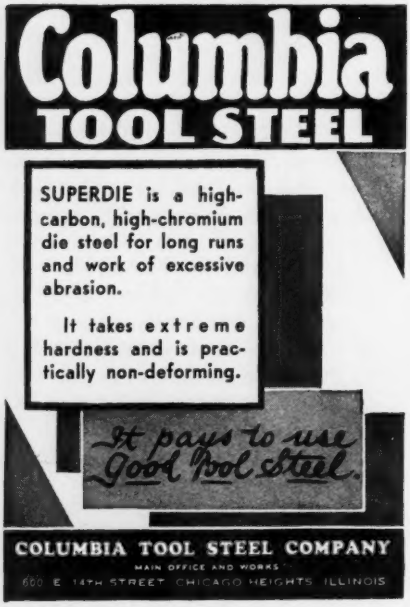
Standard equipment includes single pulley Texrope drive, center point for the spindle, centering device with dial indicator on No 4 Morse taper shank, axial indicator for measuring depths, locating microscope with reference square for accurate centering of spindle, automatic punching tool, adjustable boring tool holder Type B-4 with two high speed steel tools, adjustable to 0.0005 inch, for holes from 1 to 2½ inch diameter, adjustable boring tool holder Type G-4 with high speed steel tools, adjustable to 0.0005 inch for holes from 2½ to 4⅜ inch diameter, adjustable boring tool holder Type F-4 for holes from 4⅜ to 9 inches diameter, precision three-jaw chuck, reduction sleeve, guiding arm with 6 guide bushings for small tools, wrenches, 2 Texrope drive belts, 6 spare bulbs, and 2 protecting glasses for microscope eyepiece.

Federal No. 3 Cap Screw and Bolt Trimming and Extruding Machine

The Federal No. 3 Trimmer, made by the Federal Press Company, Elkhart, Ind., is a high speed machine for automatically trimming cap screws, bolts, and so on, and is also used for extruding. The machine illustrated will handle blanks from ½ to 2½ inches in length on all diameters ⅜ inch and smaller at the rate of 140 blanks per minute. Other sizes also are included in the line.

The frame, flywheel and ram of this machine are built on the lines of standard punch presses; a design which has proved itself to all for ruggedness and strength. This design is a radical departure from the conventional horizontal type trimmer available heretofore. The machine is inclined at thirty-five degrees with main bearings for crankshaft and ram above the point of operation where they are protected from chips and grit, which means long life and freedom from bearing trouble.

The flywheel is mounted between two friction discs with a wedge take-up which eliminates any possibility of a sprung crank shaft in case the machine should come to a sudden stop. The hopper on this machine is paddle wheel type, convenient to adjust for various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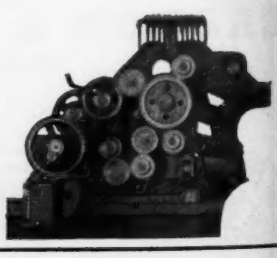

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CUT PRODUCTION COSTS

Rapidly becoming more and more extensively used for cutting off, notching and grooving operations, Macklin Bakelite Bonded Cut-Off Wheels of Aluminous Oxide and Silicon Carbide are reducing production costs in industrial plants in all parts of the country. The reason is obvious. The speed of cutting, together with the coolness of the metal or other substance cut, has replaced the old, conventional and slower method of sawing. Let us tell you more.

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS

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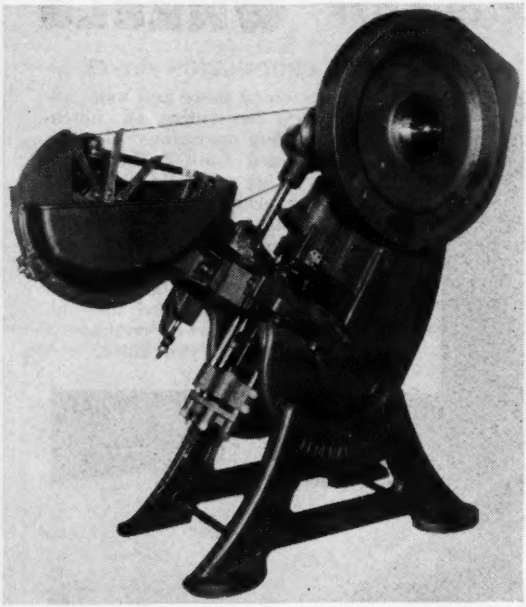
sizes and will feed to capacity all sizes and lengths within the range of the trimmer.

Several unique features of construction have been obtained by inclining this machine at thirty-five degrees from vertical. The natural position of the blanks coming down the raceway to the tools is at the same incline. This position is maintained in transferring the blanks into the tools, which means short transfer movements and high speed.



Federal No. 3 Cap Screw And Bolt Trimming And Extruding Machine

The blank transfer mechanism consists of two levers operated by direct roller contact with the cams, and there is no linkage which would be subject to wear. One lever operates the cradle for the blanks coming from the raceway, and the other lever carries the pickup fingers which carry the blanks into position.

The machine is built with taper gibs under the ram guides and when the machine is once adjusted for alignment of tools, the bolts will always be trimmed on center. Tools can be interchanged for various sizes with perfect centers maintained without dependence on the operator, as long as the tools are made concentric in the first place. The time saved by not having to adjust the tools for alignment at each change will readily be appreciated.

The movement for knocking the blanks out of the punch after trimming is accomplished with the movement of the ram on the upstroke by a bar extending through the bolster plate of the machine, this bar carrying an adjustable lug which acts direct on the knockout pin.

A patented feature of the machine is the simple device for severing or shearing the chips from the screw head. This is accomplished at the time that the punch and die have approached

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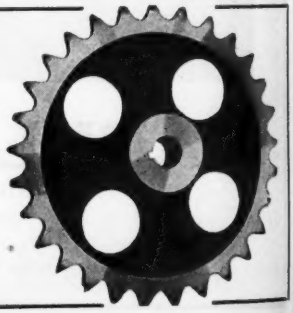

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one another to crankshaft center position, with the chips pinched between punch and die. Pressure is brought to bear on the end of the blank sufficient to separate the chips from the screw head, which results in a clean trim with no drag or burrs on the under side of the head. All levers and movements ordinarily used to accomplish this purpose are entirely done away with.

The outstanding features of the machine are its simplicity of construction with resultant low first cost, ease of operation and high efficiency, low tool cost, and low cost of maintenance.

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H & G Insert Chaser Die Hea For No. 0 B & S Automatic

The Eastern Machine Screw Corporat tion, New Haven, Connecticut, announce the development of a new style of H & G Die Head for the No. 0 Brown & Sharp Automatic Screw Machine. The hea uses inserted chasers and the chasers ar

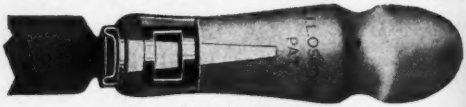
H & G Die Head for No. 0 B & S Automatic

so inexpensive that they may be thrown away when dull and new sets substituted with practically no interruptions in production and without any costly adjustments.

The head illustrated is known as the No. 101 size of Style DM. Every part on this die head is hardened and ground. It is equipped with the well known but still further improved "double arm drive" shank which takes the torque at a maximum distance from the center, thus reducing friction of pull-off.

The die head is equipped with both adjustable pull-off trip and adjustable head end trip, the latter being especially advantageous on close shoulder threading. The new die head has a remarkable capacity range as follows: Up to and

Demand Osgood's New File Handle—Safety Filegrip



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Check the savings in set-up time alone that you can make on your multiple tool jobs with increased tool life of 29:1 on Cast Iron, 32:1 on Aluminum alloys, 36:1 on Brass, Bronze or Copper, 30:1 on non-metallic materials. Such savings are possible only with Carboloy tools due to their extreme hardness and resistance to abrasion. Then add to these savings the additional economy of increased speeds, closer tolerances, less grinding time and better finish. It is because of these savings—savings not possible with ordinary tools, that many of the nation's foremost industrial concerns are using Carboloy tools extensively throughout their plants.

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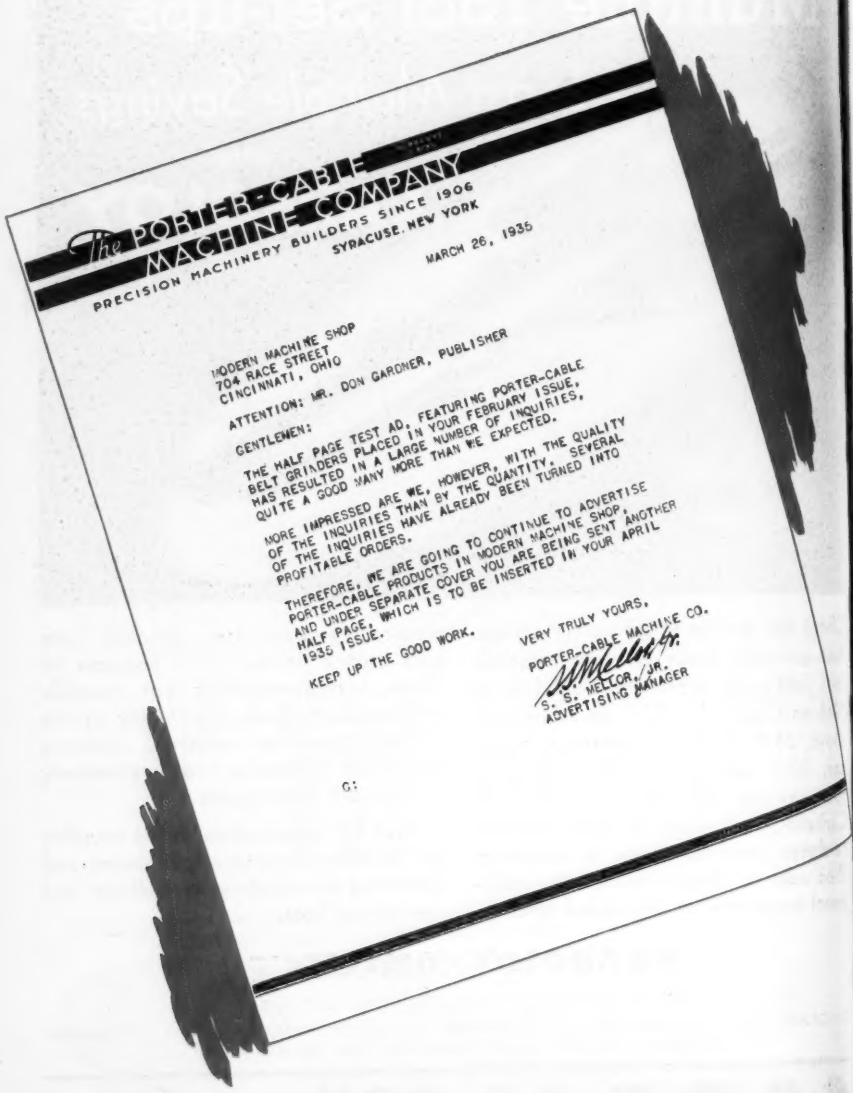

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S. S. MELLOR, JR.
ADVERTISING MANAGER

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including ⅜-in. diameter, a thread length of 3⅜-in.; up to and including 9/16-in. diameter, a thread length 1 11/16 in.; up to and including ¾-in. diameter, a thread length 15/16 in., which is said greatly enlarge the threading possibilities on the B & S automatic.

Another unusual feature is that this die head, which is only 2½ in. in diameter, uses the same chasers as the H & G insert chaser die heads used on the No. 2 B & S, ⅞ in. and 1¼ in. Multiple Spindle Machines, etc. This greatly simplifies chaser stock and permits moving work from one machine to another and still use the same chasers.

Gas Engine Driven Welder Announced by Lincoln

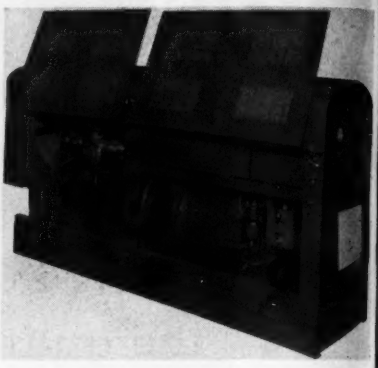
A close-coupled gas engine driven "Shield-Arc" welder for 300 ampere, 40 volt capacity is announced by The Lincoln Electric Company, Dept. M-3, Cleveland, Ohio. Due to the close coupling feature, the new unit is much more compact and of lighter weight than previous models.

The generator is mounted on the engine housing with the drive lined up on hardened steel and driven on cushioned rubber. This method of coupling takes care of any misalignment and reduces vibration.

Because there is less vibration, the engine operates at a high efficiency and gasoline consumption is lowered, according to the manufacturer. A special idling device which cuts the engine speed when the arc is broken further assures economical operation of the six cylinder engine.

The welder is supplied mounted on a rigid steel base with totally enclosed steel side curtains. Where desired, the complete unit is mounted on small factory portable steel wheels, or large six inch face steel wheels for outside use, or on two or four wheel pneumatic tired trailers.

A uniform generator current permits use of a higher average current with greatly increased welding speed. The capacity of the new welding machine is 60 per cent higher than its predecessor and it is rated at 40 volts. According to the manufacturer, the "Shield Arc" welder has 10 per cent higher efficiency



Lincoln Gas-Engine-Driven Welder

at full loads and still more on overloads, even though it is of much greater capacity.

Other features of the "Shield Arc" welder include dual control of welding heat, sparkless commutation, handy-height controls, and arc welded steel construction.

Lincontrol, a new remote current control device which enables the operator to adjust the current by merely tapping the electrode on the work, is supplied as optional equipment. No additional

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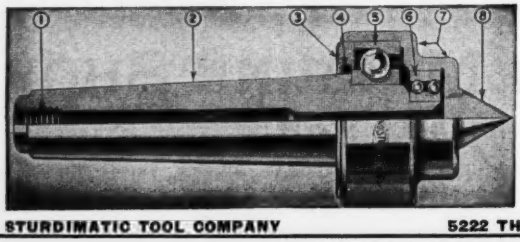

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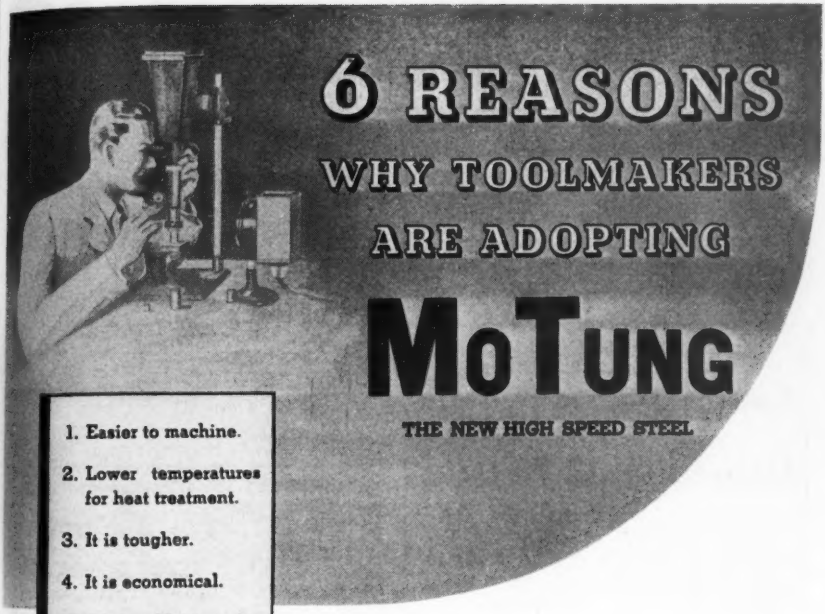

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MoTUNG, the molybdenum-tungsten high speed steel recently presented by Universal Steel Company and Cyclops Steel Company, is the culmination of metallurgical research begun as early as 1896.

Now thoroughly practical with a patented formula which provides a proper balance of composition, this brand of MO-MAX High Speed Steel comes to the trade recommended by scores of users over a period of three years.

It is our desire that **MoTUNG** be prepared properly and thus show the marked savings in time and cost which are obtainable. We suggest cooperation along these lines.

Ask your tool manufacturer for **MoTUNG** tools or write us for the new **MoTUNG** Booklet No. 101.

MoTUNG, a brand of MO-MAX High Speed Steel, is available through any of the offices or warehouses listed at the left.

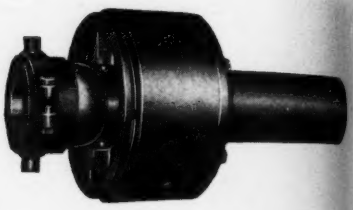
1073

cables or rheostat are carried by the operator. By quickly adjusting the current without making a trip back to the machine, much waste time is entirely eliminated.

Kinney Disk Clutch

The Kinney Manufacturing Co., 3541 Washington Street, Boston, Mass., is placing on the market a new, small, compact, fully enclosed, single point adjusting disk clutch, suitable for use either as an integral part of a machine or for general transmission of power.

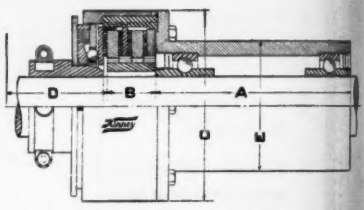
The clutch is made in three general sizes, single or double disk, with capacities ranging from 1 to 6 h.p. per 100 r.p.m. It is made either as a sleeve



Kinney Disk Clutch

clutch, with several types of sleeve bearings, or as a cut-off coupling.

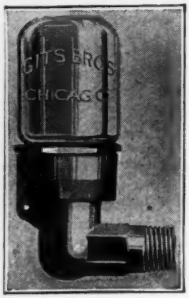
The clutch has several advantages, as follows: (1) It may be run at high speed with transmitting capacity in direct ratio to speed. (2) The friction disks are faced



Design of Kinney Disk Clutch

with burn-proof asbestos which permits extreme slippage in starting a load so that a soft easy picking up of the load is possible without jar or vibration. (3) All working parts of the shifting mechanism are heat treated, hardened steel assembled within the case front and require

GITS
Constant-Level Oilers with Unbreakable Bottles



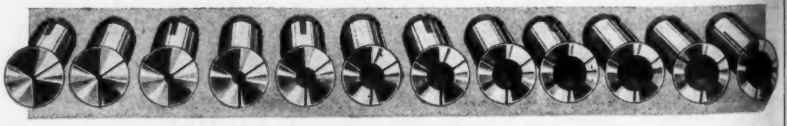
Maintain correct oil level. Prevent burning out of motors and bearings.

Furnished in both hinged and removable bottle types. Capacity 5/8 to 32 oz.

Send for Catalogue.

GITS BROS. MFG. CO.
1847 S. Kilbourn Avenue, Chicago, Ill.

RIVETT DRAW-IN COLLETS AND CHUCKS



All lines of "Rivett Mark" Collets including Hendey, Cataract, Seneca, Becker and Rivett Styles can now be purchased from the following stocks:

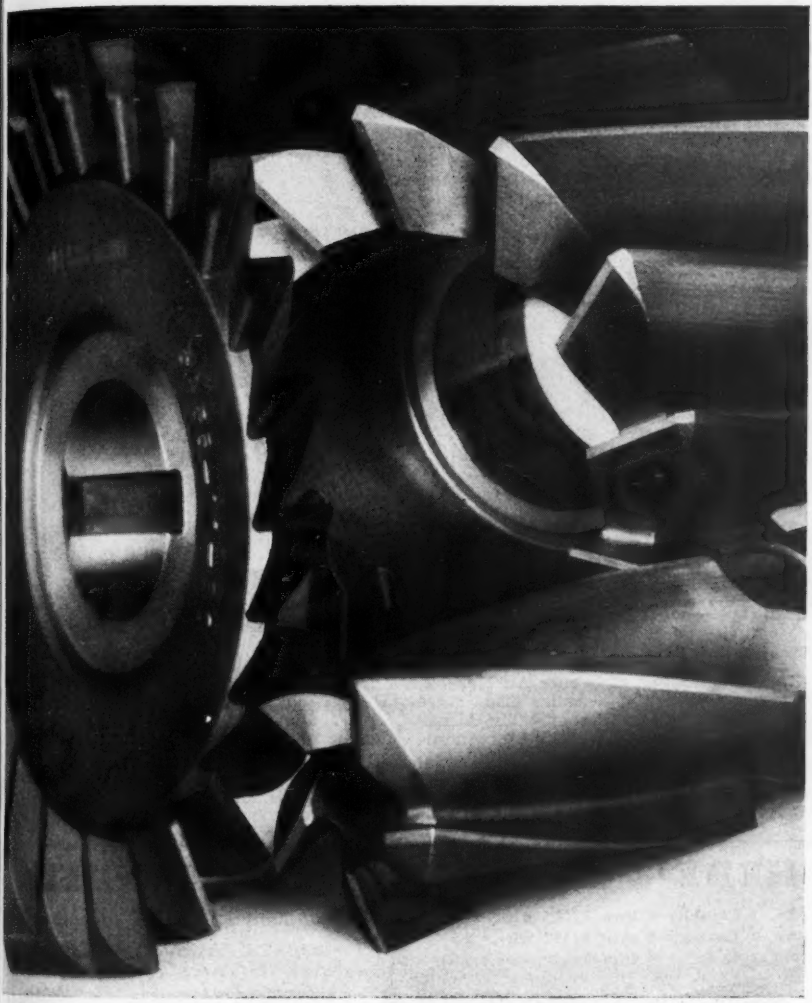
CHICAGO
R. E. Ellis Engineering Co.
621 Washington Blvd.

BOSTON
Rivett Lathe & Grinder Inc.
Brighton District

DETROIT
Chas. A. Strelinger Co.
149 E. Larned St.

Write for Bulletin 100-A and Price List

BARBER-COLMAN CUTTERS



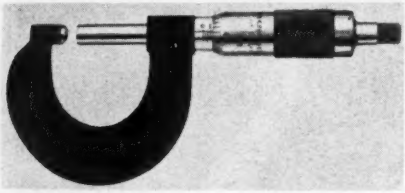
MANUFACTURED BY BARBER-COLMAN COMPANY, ROCKFORD, ILLINOIS, U. S. A.

BARBER-COLMAN CUTTERS

very short movement of the shifter cone to engage or release the disks.

B & S Tube Micrometer Caliper

The Brown & Sharpe Mfg. Co., Providence, R. I., has augmented its line of mechanics' fine tools by the addition of a Tube Micrometer Caliper having a range of from 0 to 1 inch by thousandths of an inch. The caliper, designated as the No. 228, accurately measures the thickness of tubing and pipe from 17/32-inch inside diameter upward. It will be observed from the illustration that the anvil of the micrometer is rounded on the end and projects sufficiently from the frame to provide for ease in taking measurements. A booklet describing this and other new tools can be had by addressing the company as above.



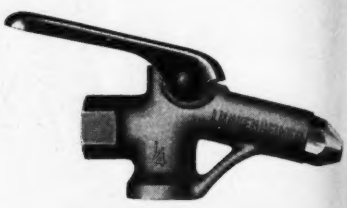
Brown & Sharpe Tube Micrometer Caliper No. 228.

Lunkenheimer Air Nozzles

Two new designs of bronze Air Nozzles, with renewable, non-metallic discs, have been placed on the market by The Lunkenheimer Company, Beekman St., Cincinnati, Ohio. One is made with integral hose end, and the other with female pipe end. Either pattern can be furnished with pointed, flat or extension tip. These air nozzles find wide application for blowing dust, dirt, chips, filings, borings, sand, lint, liquid deposits and other matter, and quickly pay for their initial cost in savings of time and labor, and prevention of air wastage.

Lunkenheimer Type 1840-PT Air Nozzle

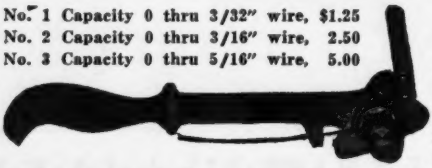
The disc is especially compounded for air service, and easy renewability insures seat tightness. To renew a disc, simply unscrew the nut at bottom of nozzle and remove spring and old disc; insert a new disc and reassemble. Unrestricted flow area permits free passage through the nozzle of scale and grit that might be carried with the air from the pipe line. Provision is made for hanging the air nozzle on a small hook when not in use.



Lunkenheimer Type 1841-PT Air Nozzle

HERE'S A REAL SPRING WINDER!

No. 1 Capacity 0 thru 3/32" wire, $1.25
No. 2 Capacity 0 thru 3/16" wire, 2.50
No. 3 Capacity 0 thru 5/16" wire, 5.00



Will Earn Its Cost in one Day

The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop... You'll like it and the price is reasonable.

HJORTH LATHE & TOOL CO. 12 BEACON STREET • WOBURN, MASS.

Lunkenheimer Air Nozzles are fully illustrated and described in booklet F-533A, copy of which will be sent upon request.

Barrett "Big Boy" Multiple Stroke Lift Truck

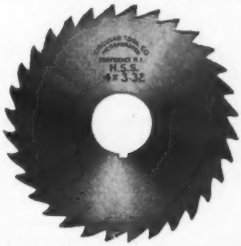
The lift truck shown in the illustration is the "Big Boy" Multiple Stroke Lift Truck which has been placed on the market by the Barrett-Cravens Company, 3257 West 30th St., Chicago, Ill. It is made in sizes to handle up to 6,000 pounds, with eight different platform sizes and lengths of frame, and in two widths.

Barrett "Big Boy" Multiple Stroke Lift Truck

A slide type of design is employed, the design being such that all strokes require the same amount of effort. The stroke can be adjusted so that a load may be lifted with either eight short or four long strokes, as desired. The handle is automatically disengaged upon release of the holding latch, and cannot fly back when the load is released.

A full 3-inch lift is obtained, which is sufficient to prevent skids from dragging under all except extraordinary conditions. The frame has a high clearance, which prevents scraping over bad inclines. Wide front wheels are provided to give greater stability to loads. The handle is always in an upright position when the truck is not in use, and will not fall. Broad handle grips aid in pulling and steering.

The **RIGHT** SAW for CUTTING METAL



Years of experience in saw manufacturing PLUS modern, up-to-date manufacturing and hardening methods enables us to produce and recommend better saws for your problems. Circle "R" Saws are made in both high speed and carbon steel, from ¼" to 10" in diameter.

Send For Catalog

Circular Tool Co., Inc.

767 ALLENS AVE.
PROVIDENCE, R. I.

$5.00 and up

New TRUCO Wheel Dressers are made in 12 sizes starting with the T1 tool, priced at $5.00. Flexible . . . economical . . . and meeting the requirements of a constant precision grinding tool.

Write for Bulletin

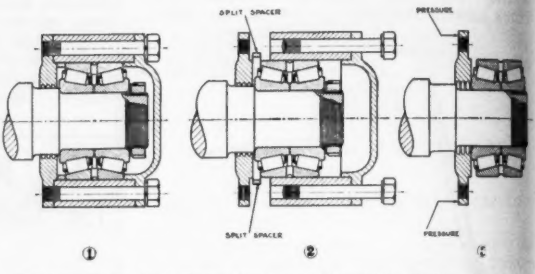
Wheel Trueing Tool Co., Inc. 13931 Oakland Ave. Detroit, Mich.

Timken Type NA Stripping Non-Adjustable Roller Bearing

In the construction of mechanical units there are cases where it is not desirable to provide means for bearing adjustment in service, or where operation conditions require a fixed mounting at one end of an assembly and a certain amount of "float" at the other. To meet this condition, the Timken Roller Bearing Company, 19th & Dueber Avenue, Canton, Ohio, has brought out the Type NA bearing shown in the illustration. In using this bearing, however, certain fits must be observed in order to obtain the proper running clearance, which is established at the time of manufacture.

In Figure 1 a two-row bearing of this type is shown mounted in a single housing. The cones are pressed into place with a tight fit, the inner cone fitting against a shoulder on the shaft. The abutting cone faces are ground at the factory to provide the proper running clearance. The cup is locked in the assembly by means of a split spacer ring on the inner end and a follower on the cover plate on the outer closure, as shown in the illustration.

This type of bearing is easily and quickly removed from the housing and shaft for inspection or salvage by the application of pressure to the cam surface.



Timken Type NA Stripping Non-Adjustable Roller Bearing

Figure 2 illustrates the first step in removing a bearing of this type. When the through bolts are loosened, the outer cover plate and bearing housing may be stripped off easily, releasing the split spacer ring which locates the bearing at the inner end.

The lock nut and tongued washer which clamp the cone to the shaft are next removed and when the split spacer ring is taken off the inner closure plate may be brought forward, contacting the inner face of the inner cone. As both cones are in contact, continued application of pressure on the inner closure plate will slide the entire bearing assembly off the shaft smoothly and with a minimum of force (Fig. 3). No pressure will be transmitted through the cup and rollers, as the bearing has a definite amount of running clearance.

Anderson Improved
Balancing Ways
No Leveling Required

A simple and excellent device for balancing straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Write for Full Information.

Mfg. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee St., Rockford, Ill.

Hutto Gear-Lapping Machine

To provide a means of lapping gears to a high degree of accuracy with consistency, speed, and facility, the Hutto Engineering Company, 517 Lycaste Ave., Detroit, Michigan, has developed a method of lapping which is said to be unlike any other method and is claimed to make possible a high standard of precision.

WIRE BRUSHING

For cleaning paint, rust and scale from cars, tanks, fabricated steel, pipe, etc.

The E-I Wire Brushing Tool shown above gives a fast thorough job with cup or radial brush.

Send for catalogue showing vertical and horizontal types for cup and radial brushes.

The Rotor Air Tool Company
5600 Carnegie Ave., Cleveland, Ohio

From the Complete Line of

Brown & Sharpe Cutters

there's a RIGHT cutter for every job. Use Cat. 31C.

B·S Brown & Sharpe Mfg. Co.
Providence, R. I.

The method features a novel principle; that of angular inclination of the lapping member with respect to the angle of the work-piece gear in such a manner as to create a line of rolling contact between the lap and the work-piece at an

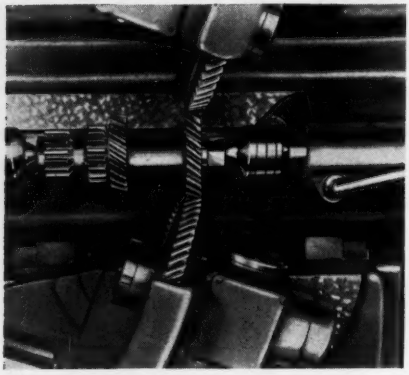


Fig. 1—Application of the "inclined axis" method of engaging the work-piece gear with two lapping members.

angular position with respect to the position of the normal line of rolling contact on the work-piece tooth.

This line of rolling contact normally intersects the conventional pitch line intermediate to the extremities of the tooth face. The transference of the line of rolling contact causes a transference of the attendant sliding action in varying degrees of magnitude to all surfaces above as well as below the transferred line of rolling contact on the teeth of the gear, subjecting the normal or conventional pitch line on the teeth of the work-piece gear to a sliding action.

In this manner, abrasive action is produced along the normal pitch line of the gear tooth by rotary motion only, without sacrificing full face width contact which is extremely beneficial in correcting bearing wobble, cross bearing, end bearing, and so on.

The "inclined axis" method employs an extremely slow longitudinal reciprocating motion solely for the purpose of uniformly distributing the abrasive effect over the face of the gear tooth in a manner similar to cylindrical grinding.

Figure 1 illustrates the application of the inclined axis method of engaging the work-piece gear with two lapping members. Two lapping members are employed at diametrically opposite sides of the work-piece in combination with a supply of suitable abrading material. The driven lapping member, through engagement with the work-piece which is in turn driven by the driving lapping member, is retarded through a braking means and pressure is thus brought to bear upon opposite flanks of the work-piece teeth to assure the desired abrading effort.

Inasmuch as the axes of the lapping and work members lie in a common plane, the "inclined axial engagement" of two or more geared members for gear lapping purposes is especially well suited to engagement of multiple lapping members with a multiple type of work-piece gear, such as a cluster or herringbone gear, and makes possible the simultaneous lapping of two or more gear members on this type of gear.

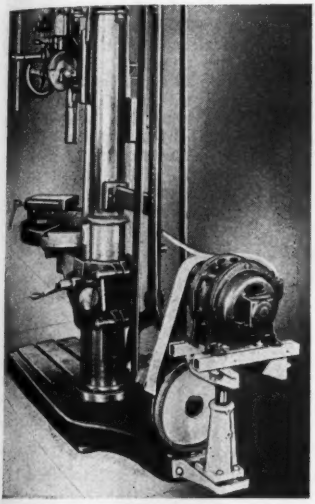
The machine, shown in Fig. 2, is simple to operate. The rotating speed and reciprocating stroke are variable; thus the machine can be set for desired combinations of both to suit the particular gear to be lapped. The lapping operation is automatic and fast, and uniformity of results is made possible.

The "inclined axis" method and lapping equipment are adaptable to any type of cylindrical gear—spur, helical, or internal. Among the inherent benefits of this method are maximum produc-

Fig. 2—Hutto Gear-Lapping Machine

tion, simultaneous lapping of two or more gears on a cluster, maximum and consistent accuracy, and flexibility of the machine to suit various types of gears and conditions.

REMCO MOTOR DRIVES



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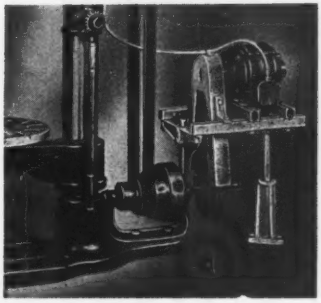
DRILL PRESSES

To convert shaft driven Machine Tools into modern individually motor driven Units.

Tremendous advantages now conceded by everyone —place tools anywhere — decided decrease in power —100% decrease maintenance of shafting, belts, oiling, etc.



Four types — Remco Drives made to fit any kind of a Drill Press. Simple—Universally adjustable, quickly applied with two or three bolts—an outstanding Drive for Drill Presses.

A complete line of Drives from Hack Saws to 42" Lathes, etc. Your whole shop can be motorized by Remco.

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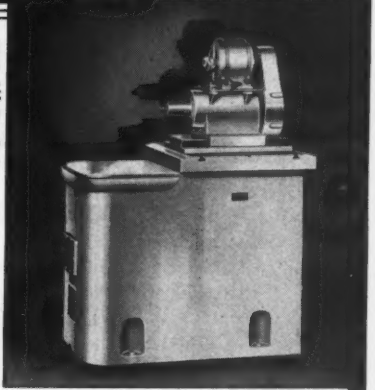
MANLEY PRODUCTS CORP.

YORK, PA.

SOMETHING *New & Different*

The CROSS HYDRO-BASIC is a hydraulically actuated basic machine which can be easily adapted to, and tooled for, an extraordinary wide variety of work. This innovation in machine tools—this HYDRO-BASIC unit—is so universal that, when suitably equipped with cutting tool head and work fixture, it immediately takes on the characteristics of the automatic and highly specialized machine for performing any of the following operations:

TURNING	REAMING
FACING	MILLING
SPOT FACING	PROFILING
DIAMOND BORING AND COUNTER BORING	DRILLING, SINGLE OR MULTIPLE SPINDLE



AND, when necessary, the tooling can be quickly changed to perform an entirely different operation on another piece of work.

OR, in the case of mass production, the HYDRO-BASIC can be equipped to handle any work in the most efficient possible manner. When the job runs out, no need for scrapping the entire machine, the HYDRO-BASIC unit is still available for another job—just replace the tooling.

CROSS GEAR & MACHINE CO. 3250 BELLEVUE, DETROIT, MICH.

SYRACUSE D NEW YORK

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. . . for all types of gears

When you want gears, you will save time and money by sending your inquiry to DIEFENDORF . . . . . Cutters of all types of gears . . . . . from all metals and other materials. Let us quote on your next requirement.

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"PROCUNIER"
HIGH SPEED, BALL BEARING
TAPPING ATTACHMENTS
Tap Perfect Holes at Speeds up to 3000 R.P.M.—Reverse at 6000.

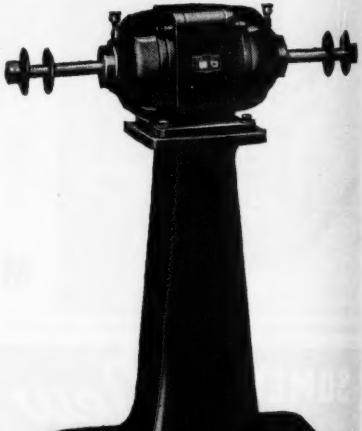
Smoother, More Sensitive COMPACT

Double-Cone, Long Life, Cork Faced, Friction Clutch.
Three Sizes with Capacities up to ½" in Steel.
Also other Styles and Sizes
Write for Literature and Prices.

PROCUNIER SAFETY CHUCK CO.
12 SO. CLINTON ST. -:- CHICAGO, ILL.

Baldor "Handy" Ball Bearing Buffer

The Baldor Electric Company, 4387 Duncan Avenue, St. Louis, Missouri, announces the development of their line of ball bearing buffers in both bench and pedestal types and in sizes ranging from 1/3-h.p. to 5-h.p. The buffer is powered by a ball bearing motor of heavy duty type with large bearings sealed and mounted in special housings to prevent entrance of dirt. The motor is dynamically balanced to eliminate vibration. Grease lubrication is necessary only about once a year. The motor is 2-h.p., 3 phase, operating at 1725 r.p.m. It is said to draw a small amount of current both at start and in operation.



Baldor "Handy" Ball Bearing Buffer

General construction of the buffer is rugged, and the wheel shaft is extra heavy. Wheels are set out to afford the maximum distance between wheel centers. Starting switch, flanges and nuts are supplied as standard equipment.

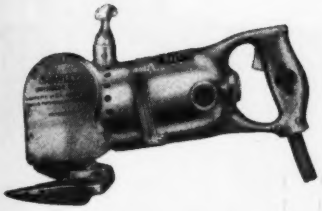
Rogers Automatic Saw Recutter and Regrinder

The illustration shows a bench machine designed for the recutting and regrinding of the teeth of dull or worn-out metal cutting saws from 2 to 12 inches in diameter. The machine, which

DURABLE ? YES

PORTABLE ? YES

INCREASED CAPACITY? YES



The Stanley Unishear No. 144 is a new tool. It will cut 14 U. S. Gauge (5/64") hot rolled steel and other materials in proportion at a speed up to 15 feet per minute.

It can be used for inside cutting by punching a hole in the sheet and slipping the yoke through. Turned edges can be trimmed off close to the surface.

The Stanley Unishear No. 144 is a new tool, but only in the sense that it has an increased capacity. It possesses all the adaptability and flexibility of its smaller brother, the "Mighty Midget," plus the ability to cut heavier materials.

We will gladly demonstrate it in your plant on your materials and at your convenience. Just tell us when and where. No obligation attached.

STANLEY ELECTRIC TOOL DIVISION

The Stanley Works
New Britain, Conn.

STANLEY

A Complete Line of Portable Electric Tools for Industry

Drills Saws Grinders Hammers
Unishears Screw Drivers Sanders

ROSS *Operating* **VALVES**

For Quick Foot Control of Single and Double Acting Cylinders

HERE is a valve that has a wide reputation for efficiency and dependability . . . the Model S. T. non-locking type foot control valve. It is of rugged, simplified design . . . it operates easily and quickly.

Normal position of foot treadle is up with piston at end of its stroke. Downward pressure on foot treadle reverses the action. It automatically returns to normal when released. Made in ⅜", ½", ¾", 1", and 1¼" sizes.

Write for Catalog Illustrating Ross Operating Valves of the hand, foot, and solenoid control types.

ROSS OPERATING VALVE CO.
6488 EPWORTH BLVD.
DETROIT MICHIGAN

is made by Samuel C. Rogers & Company, 201 Dutton Avenue, Buffalo, N. Y., is full automatic in operation and is made for belt or motor drive.

The manufacturer states that small saws can be reconditioned entirely automatically, and that the saw can be recut and reground as it becomes worn down, until the saw is entirely worn out.

An index or ratchet feed plate is one of the principal features of the machine thus a worn or damaged saw can be sharpened or recut with perfect teeth of any desired shape, with exact uniform spacing, regardless of the condition of the teeth to be recut. The index plate makes it possible to automatically shape and space the teeth of saws as small as 2 inches in diameter with no attention from the operator other than removing the saw from the machine when it is completely ground.

Rogers Automatic Saw Recutter and Regrinder

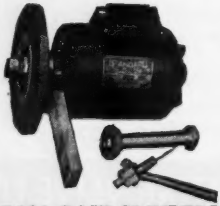
The machine is of strong, rigid construction, and all parts upon which any amount of wear comes are especially treated. All working parts are completely enclosed excepting for the grinding head and feed lever, properly protecting the mechanism from dust and dirt. All adjustments are easily accessible, however, and the machine can be operated by any unskilled mechanic. Power is applied through a 1/3-h.p. motor, or equipment can be applied for belt drive. The machine is 18 x 24 x 28 inches in size and weighs 250 pounds.

THE HEART OF THE TOOL

The spindle is the most important part of any machine tool. That's why machine tool builders are so particular about their spindles and use American Hollow Bored products. They are sure of high quality, dependable forgings and quick service. Get complete information on our spindles, shafts and hydraulic cylinders.

Write for prices.

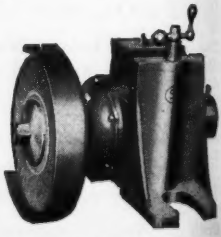
AMERICAN
Hollow Boring Co.
2000 Raspberry St.
Erie, Pennsylvania



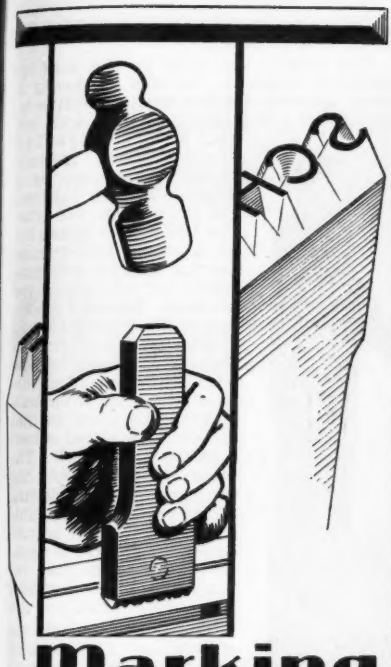
TOOL POST GRINDERS
¼ H. P., 6" Wheel
½ H. P., 8" Wheel

DRILLS: Portable Electric, Radial.
BUFFERS & POLISHERS: Direct Driven, Adjustable Speed.
GRINDERS: Motor Driven, Portable; Heavy Duty and Snagging up to 15 H.P.; Disc., 1 H.P. to 10 H.P.; Die, Angle Plate and Vertical up to 10 H.P.
Write for Complete Catalog

THE STANDARD ELECTRICAL TOOL CO.
8th & Evans Sts., Cincinnati, Ohio



Angle Plate Grinder



Marking dies

MECHANICALLY engraved steel stamps outwear the old-fashioned hand-made kind. We make: Hand stamps and stamps for use in machines, Roller dies, Embossing tools. Heat treatment by a well-manned, well-equipped department. Write for estimates on your steel stamp requirements.

"IT PAYS to Use GOOD Marking Tools"

The Schwerdtle Stamp Co.
10 Cannon St. Bridgeport, Conn.

Grinding—Filing—Polishing with More Speed at LESS COST!

this new tool saves money and improves work dozens of ways!

Faster and Better Than Hand Work

Used on Wood, Metal, Stone, Vitrified Products and Compositions.

COOL NEW BAKELITE BODY

Speed 18000 R.P.M.

Grease Sealed Ball Bearing Throughout. Efficient Air Filter. Wt. only 3 pounds.

Ask your Distributor — or write us.

● Skilsaw Hand Grinder gets at places hard to reach—plugs into any light socket, so can be used wherever the work is—does every kind of a job from rough grinding to fine touching up and careful polishing and filing.

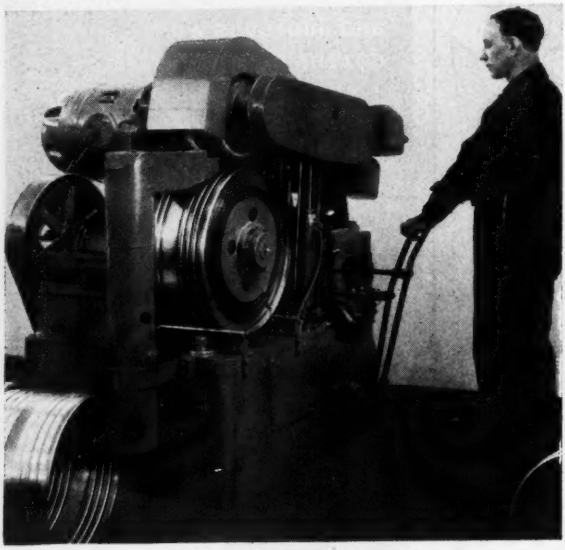
● NO TOOL YOU EVER OWNED WILL DO MORE MONEY SAVING JOBS! TRY IT AND SEE!

SKILSAW HAND GRINDER

SKILSAW, INC.
3334 ELSTON AVE., CHICAGO

Diamond Grinding and Polishing Machine

The machine shown in the illustration has been built by the Diamond Machine Company, Providence, R. I., especially for the grinding of condenser drums for use with mechanical refrigeration units. The construction of the condenser necessitates the grinding of eight circumferential welds on the face of the condenser and the purpose of the machine is to grind and polish these welds to improve the appearance of the finished units and to reduce subsequent finishing operations to a minimum.

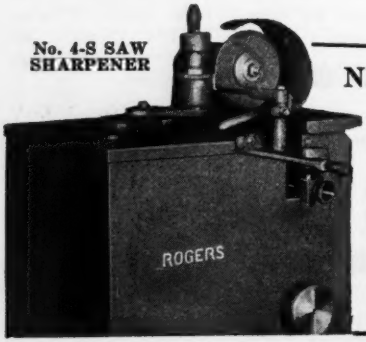


Diamond Grinding and Polishing Machine

The wheels are held to the work by constant pressure, thereby producing a more uniform surface than is possible to obtain by hand operation and with less wear to the abrasive wheels. Four 14-inch wheels are driven by a single 20-h.p electric motor through Vee-belts. The two center wheels are on a single anti-friction bearing spindle with provision for equalizing the pressure between them, and the end wheels are on separate anti-friction bearing spindles. These wheel spindles are mounted at the ends of vertically swinging arms so that they may be raised or lowered from the work. The arms swing about the centers of the driving pulleys and are variable in length for belt adjustment. Each arm is counterweighted so that the wheels are normally lifted away from the cut.

The pressure of the wheels on the work is governed by hydraulic means, each arm being equipped with a hydraulic cylinder for each wheel, the cylinders receiving their pressures from a common source, thus insuring a uniform pressure on all wheels regardless of their diameter. This equalized wheel pressure may be varied by the operator through a relief valve which determines the oil pressure. Thus adjustment may be made for uneven wheel wear or variable size of wheels. It also provides compensation for the dulled

No. 4-S SAW SHARPENER



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Slitting and Screw Slotting Saws

Saws as small as 2" dia. 10 points to the inch can be automatically sharpened. An index or ratchet feed plate is one of principal features. Thus a worn or damaged saw can be resharpened or recut with perfect teeth with uniform spacing regardless of the condition of teeth to be recut. Eliminates the necessity of replacing worn saws with new ones. Write for full particulars and low prices.

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BOTTOM CASES
Just As Accessible
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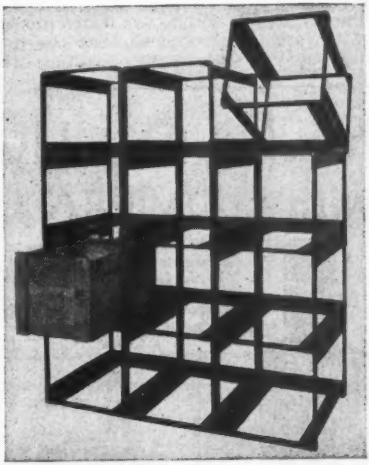
THE STACKRACK



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You save space, time and labor by storing your boxes in an orderly manner, one on top of another. With the STACKRACK, each single box, or tote pan, may be moved easily without disturbing the others . . . bottom cases just as accessible as the top.

The STACKRACK can be used under benches, behind machines, to form auxiliary stockrooms and in any other place where the front of rack is open. Welded construction provides permanence and rack is attractively finished. It is inexpensive and made to order for boxes of steel, cardboard, fibre, or wood of any size.

Write for prices. Specify outside dimensions of boxes to be stacked, approximate weight of contents, height to be stacked, and quantity.

STACKBIN CORP.

TROY ST.
PROVIDENCE, R. I.

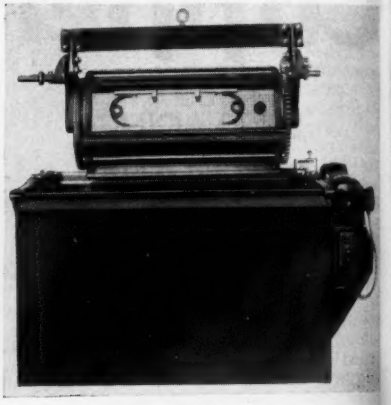
condition of worn wheels and permits the operator to govern the depth of cut as required. Power is provided by an electric motor direct-connected to the hydraulic oil pump.

The drums are held from the inside by a pneumatically-operated expanded mechanical chuck. The holding unit is equipped to take different sizes of condenser drums and the unit is rotated by an electric motor through a Reeves drive. Thus the desired peripheral speed may be obtained which gives the best results.

The controls, which are conveniently located, are interlocked so that the machine can not be operated unless the work has been firmly gripped by the fixture. As the fixture makes one revolution, four of the welds are ground. At the proper point these wheels automatically lift from the work and the work holder stops. The work is then repositioned and the remaining four welds are ground. The eight welds are ground in 35 seconds, floor to floor.

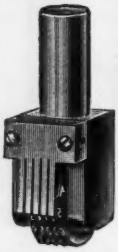
Udylite Plating Barrel

The Udylite Company, 1651 East Grand Boulevard, Detroit, Mich., has developed a plating barrel which is said to be outstanding because of its strength, durability and efficiency. The barrel is constructed of steel and shock-resistant rubber. The cylinder consists of a framework of steel into which are fitted rubber rails and heads, the entire framework being anodically charged so that it does not plate. The rubber used in the Udylite barrel is a special shock-resistant rubber, which is formed, not

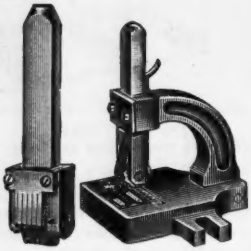


Udylite Plating Barrel

Mark It Quickly with a NUMBERALL



Made with 1 to 8 wheels. Stamp in perfect alignment. Shank for Hand or Press Stamping. Platform for stamping Name Plates and other small articles.



We also make Steel Stamps, Trade Mark Stamps, etc.

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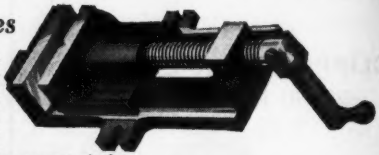
Numberall Stamp & Tool Co.

Huguenot Park, Staten Island, N. Y.

ELIMINATE SPECIAL AND COSTLY JIG FIXTURES

By Using Yost Drill Press Vises



They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A "V" shaped slot milled in the movable jaw permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations. Write us for circular "H", giving us name of your nearest dealer.

YOST MANUFACTURING COMPANY, MEADVILLE, PA.

For the QUICK TURNING OF NUTS use the FAVORITE REVERSIBLE RATCHET WRENCH

Now made of a stronger and tougher metal.

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A Time-Saver

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Send for Full Particulars

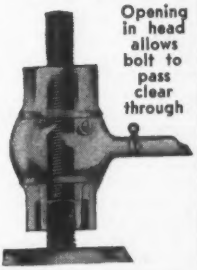
The new metal now used in Handles, Heads and Pawls enables the "Favorite" to stand up under harder and rougher usage.

Ratchet movement eliminates all lost motion. Does not leave the nut until operation is completed.

Can be used in narrower places than an ordinary wrench.

Each head can turn two different-size nuts. One in each end.

Works on a Quick Straight-Ahead Ratchet Movement



Opening in head allows bolt to pass clear through

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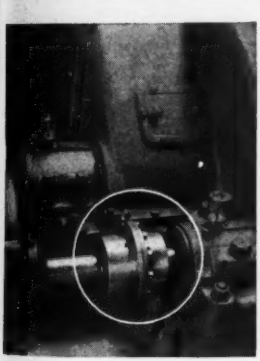

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built to stand the stress of heavy duty service

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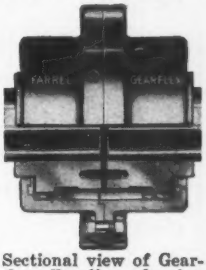
For complete engineering data, giving ratings, dimensions, weights, list prices, etc., send for a copy of our Bulletin No. 437.



Sectional view of Gearflex Coupling showing gear teeth and oil chamber.

FARREL-BIRMINGHAM COMPANY, INC.

381 Vulcan St., Buffalo, N. Y.

moulded. It does not disintegrate by absorbing plating solution and is said to resist wear to the maximum.

Treeing is eliminated in the construction of the Udylite barrel and the durability and efficiency is increased due to the highly efficient method of insulation. Every part of the steel framework is exposed and every part is anodically charged; thus all of the current is directly engaged in the plating operation. Cathode lead is encased in continuous unbroken insulation from contact bench to dangler arbor. Strains in the hanger have no effect on the lead because the cast iron hanger from which the cylinder is suspended is not integral with or a part of the cathode lead.

The bearing on which the cylinder revolves is anodic and separate from the cathode lead; thus there are no slip-joints to tree and freeze, causing the motor to burn out. There are no trees to penetrate into and destroy the cylinder material. Rails are of solid rubber and neither encase the cathode lead nor steel reinforcement. Consequently, there is no metal in the rail to expand, open up joints or crack the rail and cause treeing.

The heavy panels are of special shock resistant rubber. Rubber rails, steel reinforced, are accordingly slotted for perfect fit with the panels. Cylinder heads are of heavy rubber, reinforced with steel and plates and bolted together with ¾-inch stay-bolts. The welded steel tank is of ample size to hold heating and cooling coils. A thermo-controlled push button switch, conveniently located, guards the motor against overloading or single phasing. All gears are of steel, hardened and ground.

Punch ⅜" in ⅜", shear angle iron 2"x2"x¼", notch angle iron 2"x2"x¼" with one machine. Steel plate arc welded construction. Attachments for three different operations are quickly interchanged. Write for literature on our complete line.

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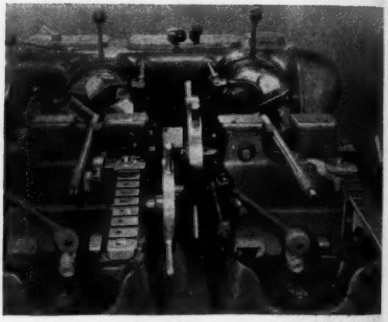
424 COLCHESTER AVE., BURLINGTON, VT.

Timing Attachment for Landmaco Threading Machine

The Landis Machine Company, Inc., Waynesboro, Pa., has placed on the market an attachment for use on their Landmaco Threading Machine for threading reduced body staybolts with a continuous pitch thread on both ends. This attachment is shown in the accompanying illustration.



Timing attachment for Landmaco Threading Machine

The timing attachment consists of a bracket attached to the carriage end cover. This bracket is provided with positions for holding the gauge bracket as may be required for various lengths of staybolts. The gauge bracket arm attached to the gauge bracket carries the gauge for timing the thread. All plain radial staybolts are threaded with a 12-pitch thread and the gauge is made to fit. The gauge arm being pivoted in the gauge bracket permits it to be moved readily for clearing or engaging the thread. The attachment illustrated on the right hand side of the machine shows the gauge swung back to permit removal or insertion of the staybolt in the vise, while the one on the left shows the gauge about to be engaged in the thread.

The usual practice is to thread one end of the staybolt in the usual manner on

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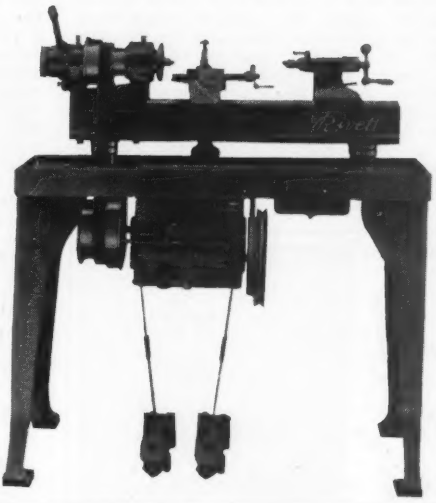

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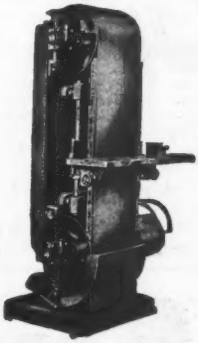

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one side of the machine without the use of the timing attachment. The set up for the other end is made with a master staybolt which has been properly threaded with a continuous pitch thread on both ends. The master staybolt is inserted in the die head and the chasers closed to properly engage the thread. The timing attachment gauge bracket is attached in its proper position for the length of the staybolt and the carriage set so that the timing attachment gauge will properly engage the thread on the back end of the master staybolt. The leadscrew gears are then disconnected and the leadscrew turned by hand until it engages the leadscrew nut, after which the leadscrew gears are again connected.

Since a 6 pitch leadscrew is used on the Landmaco threading machine and the staybolts are always threaded with a 12 pitch thread, the leadscrew nut on succeeding threads can be engaged at any point on the screw and provide a proper lead. After the original set up has been made, a thread of continuous lead on both ends of the staybolt is assured.

The timing attachment gage is made in the form of an insert held in the gage arm. This permits making lateral adjustment of the gage if desired. It also permits the use of various gages of different thread forms such as U.S., V, or Whitworth, and of different pitches at a minimum of cost and effort.

Usually only one timing attachment is required on a double head machine as its use is not required for threading the first end.

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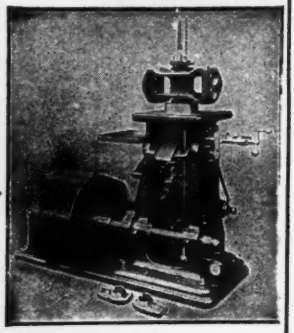

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Ruthman Model 11027 Gusher Pump

Visible piping for coolant can be eliminated from machine tools where the Ruthman Model 11027 Gusher Pump is used. This pump, shown in the illustration, is so designed that it can be installed by the use of five capscrews only, no pipe, tubes or hose being connected to the pump.

The Model 11027 pump, made by The Ruthman Machinery Company, 536 East Front St., Cincinnati, Ohio, is a vertical direct motor-driven pump in which are embodied the usual features which characterize the Ruthman Gusher Coolant Pump. Its capacity, with a 1-h.p. 1725-r.p.m. motor, is approximately 150 gallons per minute.

The pump is attached, by means of the five capscrews, directly to the outside of the machine. The intake supply

No. 2 Drilling Head with Endwise Motor Mounting

BRADFORD AUTOMATIC UNIT TYPE DRILLING AND TAPPING HEADS

Any number of these heads may be combined in one unit to meet your needs for any special operation. They can be mounted at any angle—from horizontal to vertical—to meet the highest production requirements. Unequalled for drilling, reaming, hollow milling, countersinking or tapping.
Capacity of drill heads, 0 to 1½" in steel. Capacity of tapping heads, 0 to 1½".
Spindle speeds, from 75 to 8750 R. P. M.

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End Needless Risk

With the unbreakable **MARVEL** Blades you run no risk of blade failure—of delays for breakage, of personal injury from shattering, nor of under-estimated tool cost. Every sawing job comes out as scheduled, pays its full profit. Box for box **MARVEL BLADES** out-cut, and out-last all others, still cost no more than ordinary high speed blades. Standardize on **MARVEL** for clean, fast cutting; for safety; for uninterrupted production.

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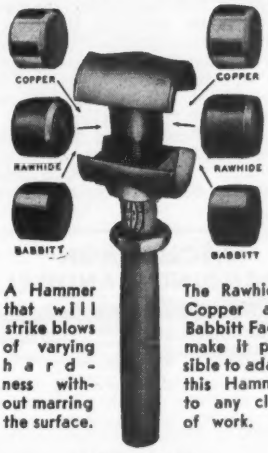

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The Rawhide, Copper and Babbitt Faces make it possible to adapt this Hammer to any class of work.

BASA

A soft-faced hammer of improved design and construction.
Illustration shows Basa being used in RCA Victor plant on transmitter antenna frame.

Made In Five Different Sizes.

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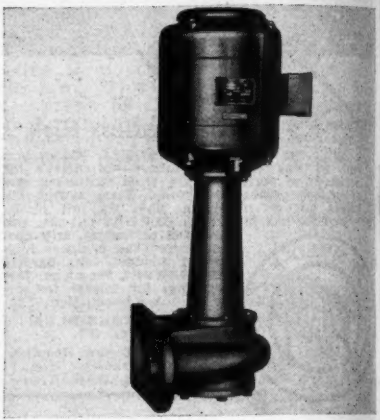
109 Duane St. New York

flows into the pump by gravity through the opening provided in the mounting pad on the side of the machine, and the discharge is transmitted directly into the base of the machine. The delivery pipe is connected, independently, to the inside wall of the reservoir, in line with the discharge opening in the pump. The pipe can be fastened to the wall of the machine by threading, caulking, or expanding. Thus the piping is confined to the inside of the machine.

The high efficiency of the pump is made possible by its internal twin-suction intakes. There are two separate compartments communicating independently with the upper and lower eyes of the impeller. When in operation, the resulting double pumping action creates a hydrostatically-balanced thrust which counteracts the natural weight of the vertical shaft.

Self-cleaning is accomplished automatically when the discharge flow is throttled. The internal agitation thereby created is harnessed to exert outward



Ruthman Model 11027 Gusher Pump

pressure through the intakes to clean the main intake chamber.

The pump has no packing nuts, foot or relief valves. There is no metal-to-metal contact within the pump; thus it can handle all types of coolant compounds and non-lubricating liquids. Its one-piece vertical shaft revolves on two large ball bearings which are sealed high and dry within the motor.

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TURNING a solid mandrel up for every job is nearly as bad shop practice these days, as making a solid reamer for every job instead of using an expansion reamer. Write us about Expanding Mandrels.

W. H. NICHOLSON & COMPANY
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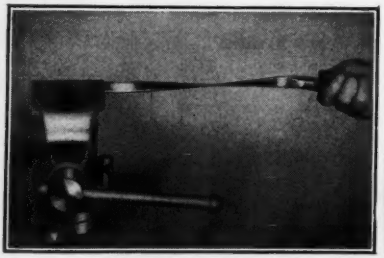

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Easy to pick out small tools and stock.

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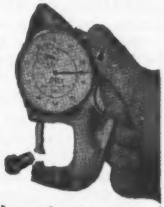

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1. One inch capacity
2. Finger grip for easy handling
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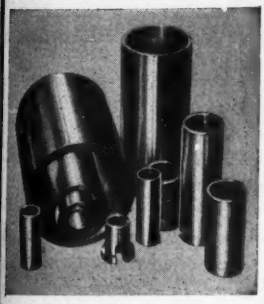

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BRONZE BUSHINGS • BEARINGS
MACHINED AND CENTERED BRONZE BARS
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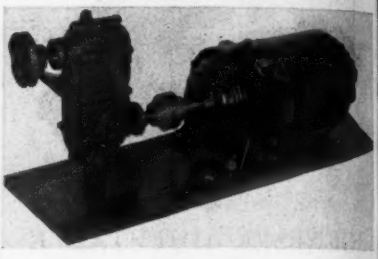
Wicaco Adjustable Fuel Oil Pump

It will be interesting to users of light commercial and industrial oil burners to know that an adjustable gear pump has been recently introduced by the Wicaco Machine Corporation, Wayne Junction, Philadelphia, Pa. This new pump will handle heavy Bunker "C" fuel oil efficiently. Due to the fact that Bunker "C" oil is cheaper than No. 5 fuel oil and because it has more B.T.U. value, the use of this pump offers a considerable saving to the consumer and, in one particular instance, the installation of twenty of these pumping units showed a saving of $6800 annually.

The Wicaco Adjustable Type Bunker "C" Fuel Oil Pump completely eliminates all of the disadvantages of regulating valves, which heretofore has made the burning of this oil impractical in light commercial and industrial burners.

The usual clogging of adjustment valves and its resultant dangers is completely eliminated. A nontechnical engineer can operate the burners with little or no attention whatever.

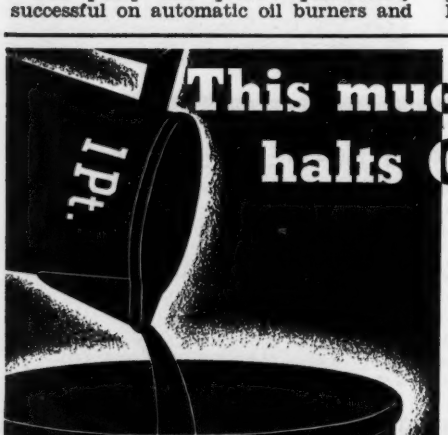
The pump has proven particularly successful on automatic oil burners and can be supplied either in a separate motorized unit or in some cases as an attachment to several of the well-known



Wicaco Adjustable Fuel Oil Pump

oil burners. The installation of the necessary heating apparatus for these pumps is very inexpensive and the saving by using a cheaper oil will pay for the installation expenses in a very short time.

Another interesting feature about the pump is its ability to pump oil at very low temperatures, and that oil can be



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Are especially desirable for producing clean cut, accurate parts with compound dies. For after operations, swaging, piercing, trimming, etc., the overhang type is preferred. We have had a long experience in making such dies. Please send us samples or drawings for estimate.

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PADS with exclusive features make Sutton Master-Type Fingers and Compensating Collets economical equipment for screw machines. One master and different pads handle practically full range of one machine. Hole size of finger pads can be restored many times before replacing. Collet pads are diamond-serrated and self-adjusting. They grip tighter under less pressure and conform to hot-rolled stock. Send for Catalog No. 11 showing full Sutton line of screw machine accessories.

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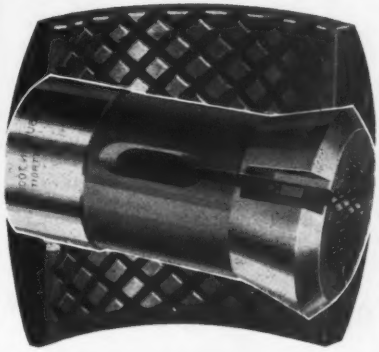

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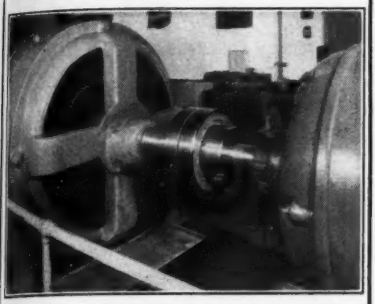
The Pyrometer Instrument Co., 101-105 Lafayette St., New York, N. Y., announces a line of "Pyro" Surface Pyrometers in the design of which a number of

Type B "Pyro" Surface Pyrometer

improved features are incorporated. The instruments are furnished in two designs; the Type A, for use on flat surfaces, and the Type B, for curved surfaces. The instrument is self-contained, portable, compact, quick-acting, and accurate, and can be used on curved, flat, stationary, or moving surfaces. It is said to be of rugged design, and has a sensitive galvanometer system with an unusually heavy permanent magnet, insuring long life and reliable indication over a long period of service.

A feature of the "Pyro" surface pyrometer is the fact that the reading of the actual temperature need not be simultaneous with the contact. This feature is of great importance where the pyrometer is used under difficult plant conditions and where the operator is handi-



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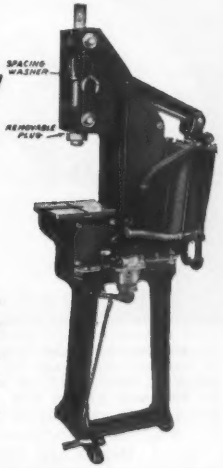

Rapid and efficient operation. Two bearings for the ram insuring long life without side play. Pull is transmitted from the base casting and the piston stops in the cylinder at the end of the stroke, reducing strain on the frame to a minimum. Eight sizes varying in power from 1000 lbs. to 1800 lbs.

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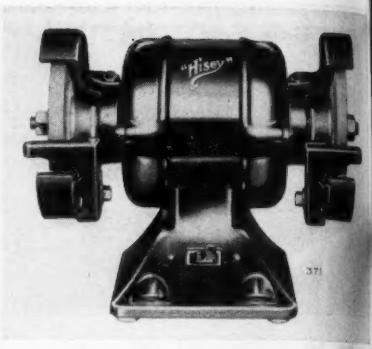
capped in trying to make the proper contact and read the temperature at the same time.

The Type A instrument for flat surfaces, can be furnished with scale ranges from 30 to 400 deg. F., 30 to 600 F., 100 to 900 F., and 100 to 1400 F. The Type B (bow type), for curved surfaces, has ranges from 30 to 2500 F., 30 to 400 F., 30 to 600 F., 100 to 900 F., or 100 to 1,000 F.

Hisey ¼ H. P. Bench Grinder

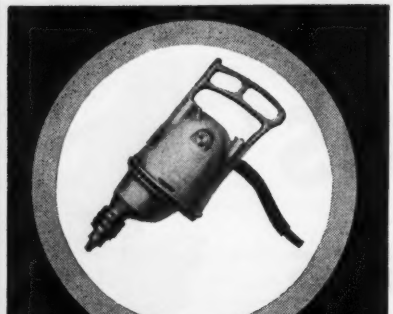
A sturdily built bench grinder suitable for light tool grinding and miscellaneous grinding jobs is now being built by the Hisey-Wolf Machine Company, 2745 Colerain Avenue, Cincinnati, Ohio. The machine is of symmetrical design, and the spindle is equipped with ball bearings which are sealed to exclude dust and dirt. Single-phase machines are equipped with split-phase motors with low starting current.

The machine can be equipped with 1-h.p., 110 volt or 220 volt motor or 3-h.p., 220 volt 60 cycle a.c. motor, or 115 or 230 volt d.c. motor. Wheels are 6 x ¾ inches, and the machine is intended to operate at a no-load speed of 3500 r.p.m. The distance between the



Hisey ¼-H. P. Bench Grinder

wheel centers is 11 inches. The size of the base at the bottom is 7 x 9 inches and the height from the bottom of the base to the center of the spindle is 6 inches. Standard equipment includes 2 grinding wheels, 2 wheel guards, and attaching cord. The weight net is 45 lbs. A pedestal, built to afford a height of 49 inches from floor to spindle, weighing 65 lbs., is available upon request.



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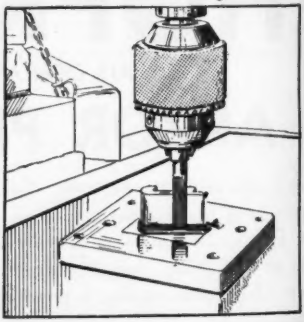

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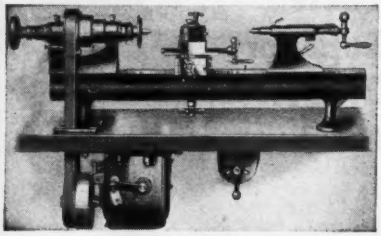

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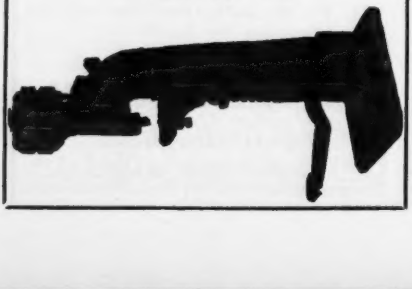
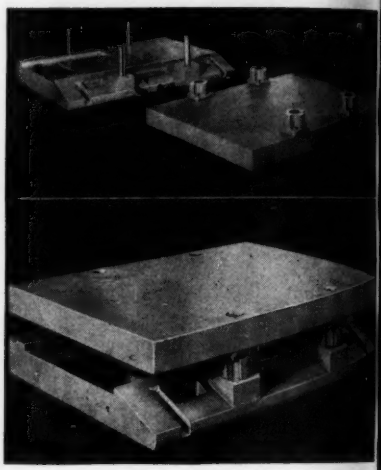


Danly All-Steel Die Sets and Demountable Boss Sets

The economy of torch-cut and welded steel plate die sets produced experimentally in the past by Danly Machine Specialties, Inc., 2122 S. 52nd Ave., Chicago, Illinois, has led to the development of a standard line of all-steel shoes and punch holders. Working in connection with tool engineers of leading automotive companies, eight types of die sets have been selected as the most useful to the industry and a series of standard sizes has been developed covering a wide



Assembled and unassembled view of combination No. 2 Danly Demountable-Boss die set, designed for use where the shut height of the press is limited and where dies must be changed often.

range of dimensions. These sizes, while carried as standard for immediate fabrication and shipment, by no means limit the possibilities as any size or shape of die set can quickly be made by this method. Complete plate stocks are carried in all thicknesses from 1 inch to 6½ inches.

The line includes Danly steel standard die sets with back posts, diameters 6 to 20 inches; round die sets, center post, diameters 10 to 24 inches; rectangular die sets, back posts, 6 x 12 to 20 x 35 inches; rectangular die sets, diagonal posts, 6 x 8 to 20 x 35 inches; rectangular die sets, center posts, 10 x 12 to 28 x 28 inches; rectangular die sets, center posts, 10 x 30 to 40 x 100 inches, and 4 post die sets, 10 x 12 to 28 x 28 inches.

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and quality products are the deciding factors—price is the same—that's why hundreds of other large manufacturers order Buckeye quality—from the stock cards. Send for them. Card "G" lists 645 stock sizes of finished bushings—Card "K"—stock sizes of Buckeye electric motor bearings. Send for cards "G" and "K". Then, you too, can get prompt shipment of the exact size you want *from stock*. No obligation. Write today.

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Atlas Brass Foundry Co. 1901 Santa Fe Ave., Los Angeles, Calif.

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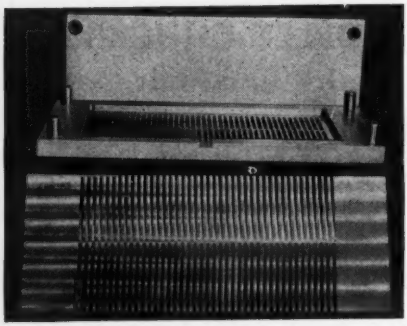
In the Danly demountable-boss sets, the boss replaces the usual bushing and is regularly held to the shoe or punch holder by four socket head cap screws.



The Danly steel standard die set for use on a blanking operation. The slotted slide at the bottom carries the stock out of the press.

The bosses are readily removable, thereby also releasing the bench and making the complete surface of the shoe or holder or the die or punch mounted in them readily available for any type of work. Danly demountable-boss sets are also very useful when more than one die is mounted in the set, as the ready removal of bosses and pins facilitates changing dies.

Combination No. 1 is intended for heavy duty work requiring unusual rigid support, accessibility and ease of changing dies. Combination No. 2 is an alternate. In this type, guide posts pressed in the die holder are recommended for use where the shut height of the punch press is limited.

Danly demountable boss sets are made in both 2 and 4-pin series, in all sizes from 10 x 30 to 30 x 100 inches for the 2-pin series and 10 x 30 to 50 x 100 inches for the 4-pin series.

Lyon 35 Model Hydraulic Lift Truck

The Lyon Hydraulic Lift Truck, made by the Lyon Iron Works, Greene, N. Y., is now made in three standard capacities of 3,500 pounds, 5,000 pounds, and 6,000 pounds. The 35 Model is built with a new type of angle iron frame instead of the channel or flat bar, adding to the rigidity and strength and providing a wider bearing for the skid platform.

The front wheels are equipped with Timken Roller Bearings, which take side

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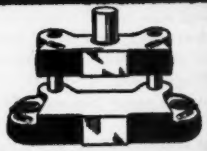

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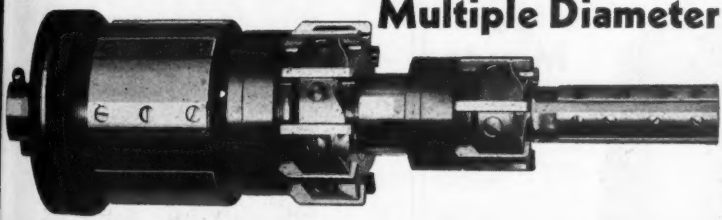

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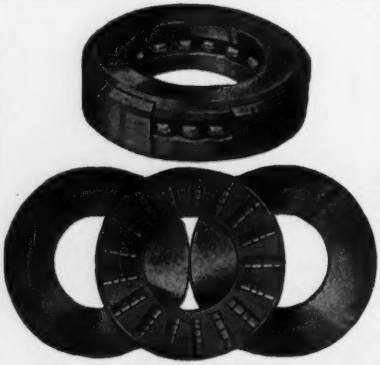

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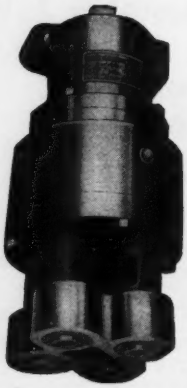

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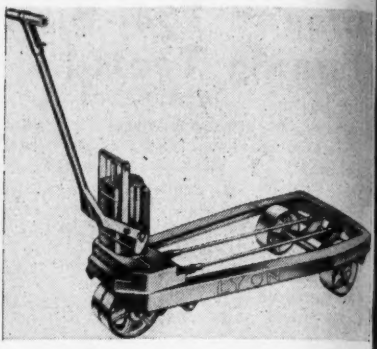
thrust when turning, make the steering easier, and lessen wear on the wheels. The head has a smooth top, making it easy to keep clean. A leak-proof air



Lyon Model 35 Hydraulic Lift Truck

vent is provided which allows the truck to be turned over in order to grease the wheels, or for other purposes, without loss of oil. The truck is painted green and trimmed with aluminum.

National Handy Shaper Vise Attachment

The illustration shows a shaper vise attachment, made by The National Machine Tool Co., 1536 E. Clark St., Racine, Wis., which is said to make possible a

Work can be end-shaped to perfect squareness in the National Handy Shaper Vise Attachment.

considerable saving in set-up time on shaping operations. The attachment is made so that it can be applied as a part of the regular shaper vise. It clears the main table of the shaper, and by its use long pieces can be end-shaped to posi-

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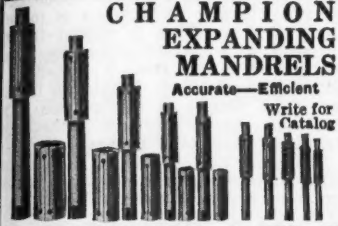

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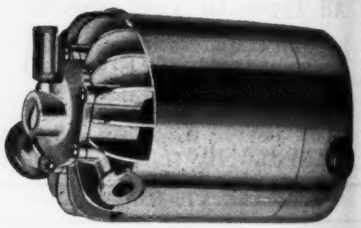
tive squareness and length without difficulty. It also permits the taking of over-all measurements with the micrometer or vernier without removing the work from the vise.

The attachment permits changing from end-shaping to ordinary shaping without changing the position of the vise or raising or lowering the machine table. To install the attachment, the jaw of the shaper vise is removed and clamped to the jaw furnished with the attachment, using the old jaw as a jig for drilling the holes in the jaw of the attachment. The attachment jaw is then bolted in place of the regular jaw as shown in the illustration. One cam adjustment screw in the jaw of the attachment is provided to adjust the attachment to absolute squareness after attaching it to the vise.

The attachment is furnished in two sizes. The Model A, for shapers of 16 to 20-inch stroke, provides a maximum opening of jaws of 6 inches and weighs 26 pounds. The Model B, for 24-inch stroke shapers, is made with jaws that open 8 inches and weighs 35 pounds.

Dumore Compressor Motor

The Dumore Company, 28 Sixteenth Street, Racine, Wisconsin, is now building a combination motor and compressor, illustrated herewith. The motor is air cooled, has a 1/10 h.p. rating, and is of the universal type, operated on either alternating or direct current up to 60 cycles.



Dumore Compressor Motor

The compressor part of the unit develops a dead end pressure of 20 pounds, while a check on the air velocity of the motor will show it to be 650 ft. a minute at the ¼-inch discharge vent.

Weighing but 3¾ lbs., the unit is easily adapted to any small device requiring a light portable compressor, and is especially adaptable for use with paint spraying devices and similar applications.

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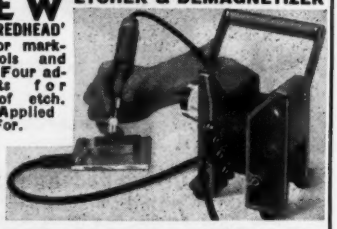
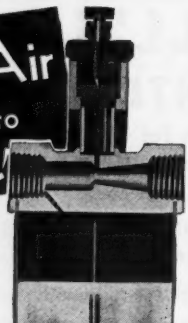

TAYLOR SALES 15505 Linwood Detroit, Mich.

Oiled Air will be kind to your tools.

Norgren Sight Feed Automatic Air Line Lubricator envelopes every moving part of the air driven tool in a fog of oil—does it continuously, automatically, economically. Saves tools, lubricant and labor. Keeps tools in condition, avoids production delays due to frozen parts.
Sizes range from ¼ in. to 1½ in., prices $5.00 to $24.00. Two styles, horizontal and vertical. We ship on approval to any rated company.
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½ to 100 K. V. A.
ELECTRIC SAW BRAZING MACHINES, BUTT, WIRE, PORTABLE AND SPECIAL WELDERS

Welders as low as $35.00
Submit Samples for Test.
No Obligation.
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Dealers Wanted.
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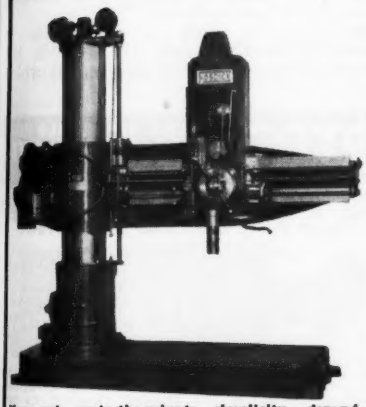
IMPORTANT ADVANTAGES on the ECONOMAX RADIAL



You get up-to-the-minute simplicity, dependability, and ease of operation in FOSDICK Economax Radial Drills. Important features include:

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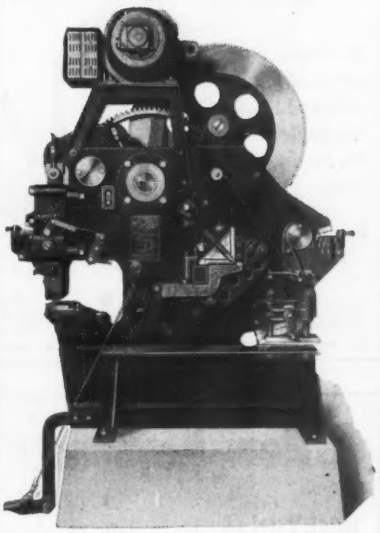
CINCINNATI, OHIO

Cut COSTS with this Buffalo Iron Worker



If you cut angles, squares, rounds, flats, tees or structural shapes — if you punch holes in metal —if you shear plates—you are probably paying for a Buffalo Universal Iron Worker once or twice a year—in additional labor and power costs.

3 - MACHINES - IN - 1

Here is a combination punch, shear and bar-cutter which cuts metal fabricating costs to a fraction. It has the famous Buffalo "Armor-Plate", electrically welded frame, guaranteed forever. Made in three sizes, Buffalo Universal Ironworkers make clean smooth cuts, neat round holes.

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Machines for notching, cutting, and bending angle iron. Made in two sizes.

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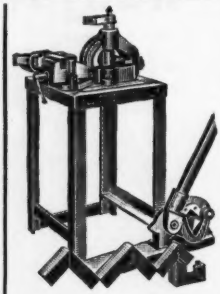

WHITNEY METAL TOOL CO.
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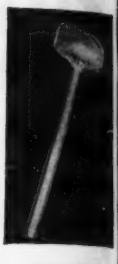
"Republic" Lead Hammer

Lead hammers for machine shop use, made in sizes of from one to six pounds each, can now be purchased from the Republic Lead Equipment Company, 7930 Jones Road, Cleveland, Ohio. The hammer head is made of antimonial lead and the handle is of ½-inch steel pipe.



"Republic" Lead Hammer

Before casting the head, the handle is coated with a skin coating of chemically pure lead, burned homogeneously to the steel, forming a perfect bond between the lead and the steel handle. The method of homogeneous lead burning used is comparable to Class 2 welding, and is used in the chemical industries in equipment which

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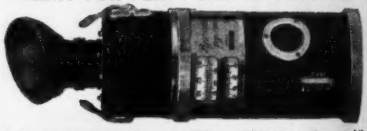

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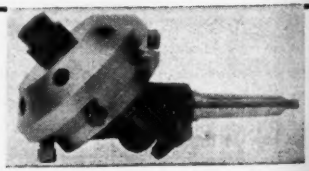

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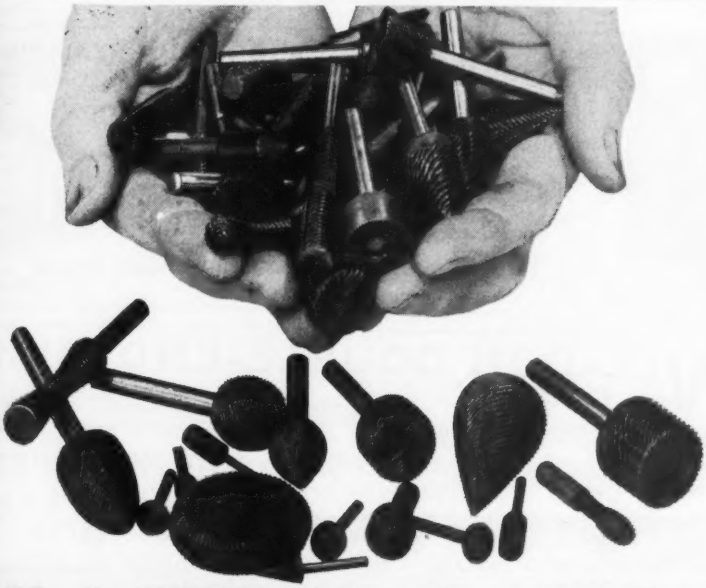

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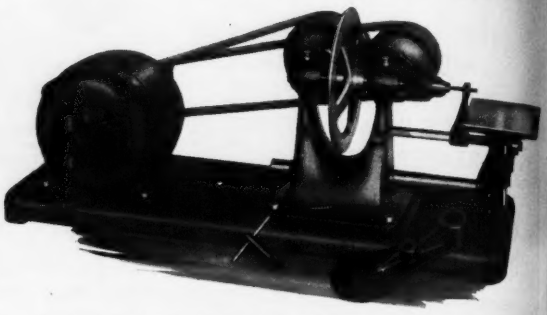
is subjected to high temperatures, high pressures, and high vacuum.

Hammers larger than six pounds can be made to special order.

Rickert-Shafer Friction Drive Tapping Machine

The machine shown in the illustration is the 3/16 inch bench type friction drive tapping machine now being marketed by Rickert-Shafer Company, Erie, Pennsylvania. The machine is comparatively small in size and is extremely sensitive in operation. The method of driving the spindle involves the use of two frictions, providing the advantages of insuring the taps against breakage and making reversal practically instantaneous. This feature is highly desirable, especially when small taps are used.

The outstanding feature of the motor driven bench machine is its convenience. The motor normally used is a single phase 110 volt a. c. motor, but any type of motor desired can be supplied. When shipped, the machine is complete in every way, including two rubber Vee-belts for driving, a switch, cord and plug. The manufacturer states that the machine can be set up and in production within five minutes. The weight of the smallest machine is 50 pounds, making it easily portable. It is ready for operation when the connection is plugged into a light socket.



Rickert-Shafer 3/16-Inch Bench-Type Tapping Machine Arranged For Direct Motor Drive.

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Burned homogeneously to handle. Ideal for machinists, tool and die makers, pattern shops, sheet-metal shops, coppersmiths, body builders, silversmiths, etc. Write for prices.

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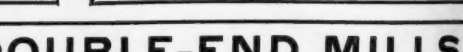
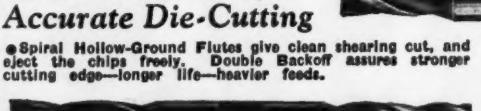
For Fast, Accurate Die-Cutting



●Spiral Hollow-Ground Flutes give clean shearing cut, and eject the chips freely. Double Backoff assures stronger cutting edge—longer life—heavier feeds.



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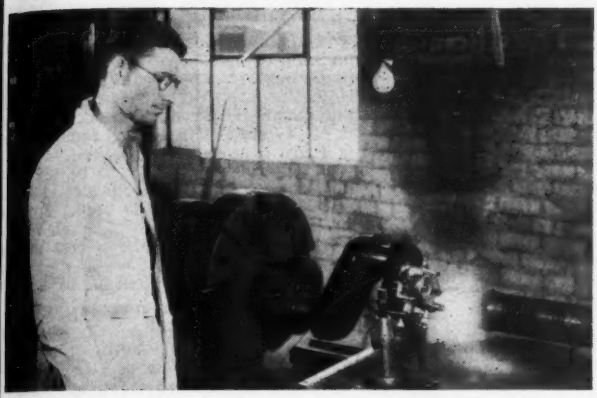

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SIGNAL BULLETIN OF OB-TYPE ELECTRIC DRILLS: This bulletin, issued by Signal Electric Manufacturing Company, Menominee, Mich., gives complete descriptions together with illustrations of the Signal Type OB-4 standard duty and Signal Type OB-5 standard duty portable electric drills. Complete specifications are given for both tools. Copy free upon request.

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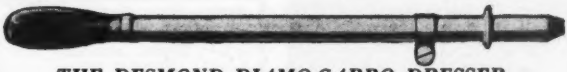

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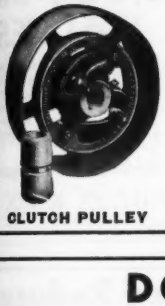

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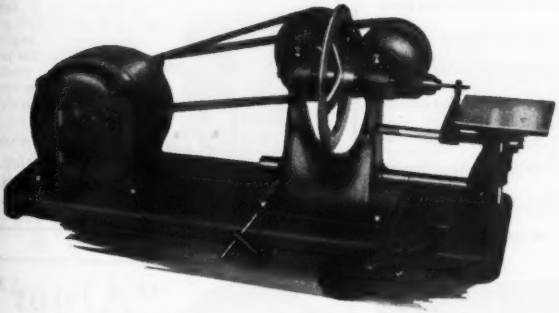

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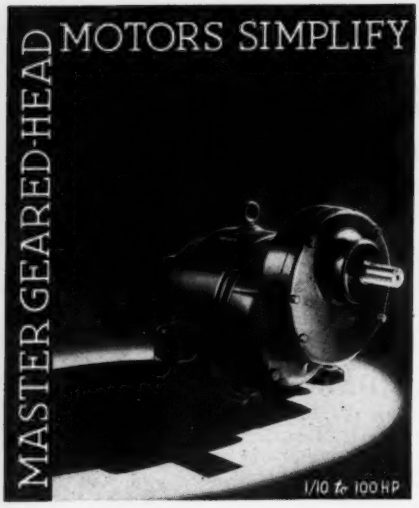

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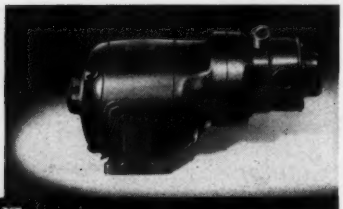

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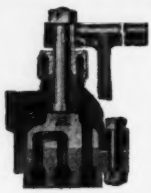

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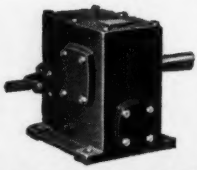

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The Cross Gear & Machine Co., 3250 Bellevue Ave., Detroit, Michigan, has issued circulars describing the complete line of Cross Gear Tooth Round, Pointing, Chamfering, and Burring machines made by this firm.

Circulars and folders describing and illustrating the Cross Hydro-Basic Machines — machines which are easily adaptable to a wide variety of operations such as diamond boring, tungsten carbide boring, facing, turning, profile milling, conventional milling, multi-spindle drilling, and so on—are also being released for distribution.

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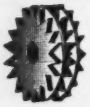

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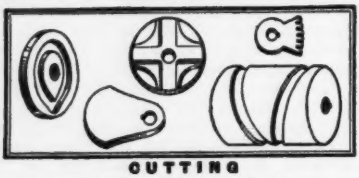

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ECLIPSE CATALOG No. 35: The Eclipse Counterbore Company, 7410 St Aubin Street, Detroit, Michigan, announces their No. 35 catalog for immediate distribution. The catalog, which is 6 x 9 inches in size, is unique for to catalogs in that it has a five-ring binde cover and the pages are of the loose-l type, permitting quick replacement

changes and the addition of new litera ture on Eclipse products as it may b published from time to time. A new index is provided which enables th reader to quickly locate the tool in whi he is immediately interested.

The No. 35 catalog contains comple data on the new radial drive which w introduced to the trade two years ag Another new addition is the 0.001-inch adjustable variable length holder, a re cent development of this company. A complete line of cemented carbide tip ped turning tools, rotating tools of th particular types is also listed, togethe with the latest development in soli hollow milling cutters with relieved in ternal teeth.

Data on various specialized lines

"OUTWEARS
the best
—Bronze Metal"

ARGUTO OILLESS BEARING CO.
Wayne Junction, Philadelphia, Pa.

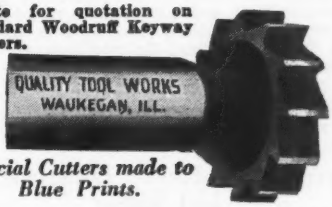
Greenerd

Arbor Presses

Write for our Catalog 36 showing 64 different styles

Greenerd Arbor Presses
NASHUA, N. H.

Write for quotation on standard Woodruff Keyway Cutters.



Special Cutters made to Blue Prints.

QUALITY TOOL WORKS
Waukegan, Illinois

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PRECISION MEASURING INSTRUMENTS

Dial Micrometers—Comparators—Thickness Gauges—Cylindrical Gauges—Wire Gauges—Thread Gauges—Depth Gauges—Grinding Gauges.

Ask For Catalog

The above are standard stock instruments but we have over 1000 prints of special gauges on file to take care of your special gauging problems and if we do not have it we will design it for you.

FEDERAL PRODUCTS CORPORATION
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71% GREATER PRODUCTION

with Porter-Cable Grinders

"The grinding time on one of our small metal parts when put on your belt grinder was reduced from 1¾ minutes to one minute each. Sixty in hour instead of thirty-five, and a better job." Name on request.

•

Pictures to right show manifold and machine part being ground on 10-inch Type B-3.

Porter-Cable Belt Grinders are built in several models, one of which is certain to exactly suit your requirements.

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LET US run a test on one or more of your ground parts and give you actual figures on these savings—or write for further details. No obligation of course.

PORTER-CABLE MACHINE CO.
300-4 Wolf St. Syracuse, N. Y.

confined to brief descriptions in large readable type and an abundance of illustrations. A special tool section depicting many practical Eclipse tool applications, photographed on location, will be of particular interest to tool engineers.

A copy of the catalog will be sent free to any mechanical executive or engineer.

Error: "Red-Head" Demagnetizer and Etcher

In the description of the "Red-Head" Demagnetizer and Etcher which appeared on page 106, March issue of Modern Machine Shop, the height of the machine was given as 15½ inches. This was an error; actually the machine is 5½ inches high.

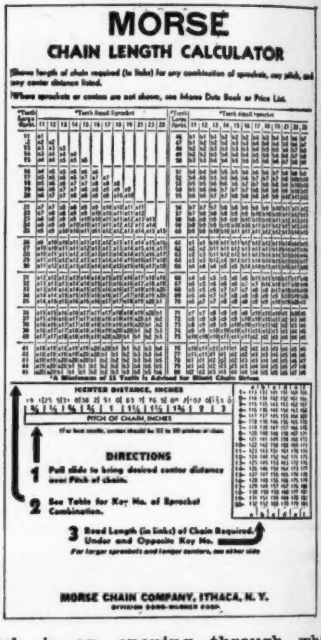
FLEXOID INDUSTRIAL COUPLINGS

Folder No. S-114, issued by The Smith Power Transmission Co., 1213 West Third St., Cleveland, Ohio, describes and illustrates the Flexoid Industrial Couplings made by this firm. A table showing the sizes of coupling to be used with the various horsepowers and speeds is given on the back of the folder. Copies gratis.

Morse Chain Length Calculator

Transmission engineers, conveyor engineers, master mechanics, and other executives who control the specification or purchase of silent and roller chain for chain drives will be interested in the Morse Chain Length Calculator which is now being issued to such executives and engineers by the Morse Chain Company, 444 Turner Pl., Ithaca, N. Y.

The calculator consists of a flat case containing the sliding section that slides when pulled. On the casing is a table indicating the key number for any combination of a large sprocket with a small one according to the number of teeth. Extending across the casing is a scale of "pitch of chain" in inches, above


MORSE
CHAIN LENGTH CALCULATOR
DIRECTIONS
1 Pull slide to bring desired center distance over Pitch of chain.
2 See Table for Key No. of Sprocket Combination.
3 Read Length (in links) of Chain Required, Under and Opposite Key No.
MORSE CHAIN COMPANY, ITHACA, N. Y.

which is an opening through which, when the slide is pulled, appears the various center distances. When the required center distance for a given pitch of chain appears, the length, in links, of the chain required will be found opposite a scale of key numbers.

One of these charts will be sent, free, to any mechanical executive who addresses his request to the Morse Chain Company, at the above address.

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